WASHINGTON
Traffic Safety
COMMISSION

Washington State Department of Transportation

Rural Road Safety in Washington

- WTSC – A unique integrated systems approach
- The State SHSP: Target Zero, a powerful tool
- Rural road crash data
- Safety priorities 1 and 2; Proven strategies
- Putting it all together on SR 14

COMMISSIONERS

- Governor, Chair
- Secretary of Transportation
- Secretary of Health
- Secretary of Department of Social and Health Services
- Chief, Washington State Patrol
- Director of Licensing
- Superintendent of Public Instruction
- City, County, and Judiciary Representatives

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Target Zero: Washington's Strategic Highway Safety Plan

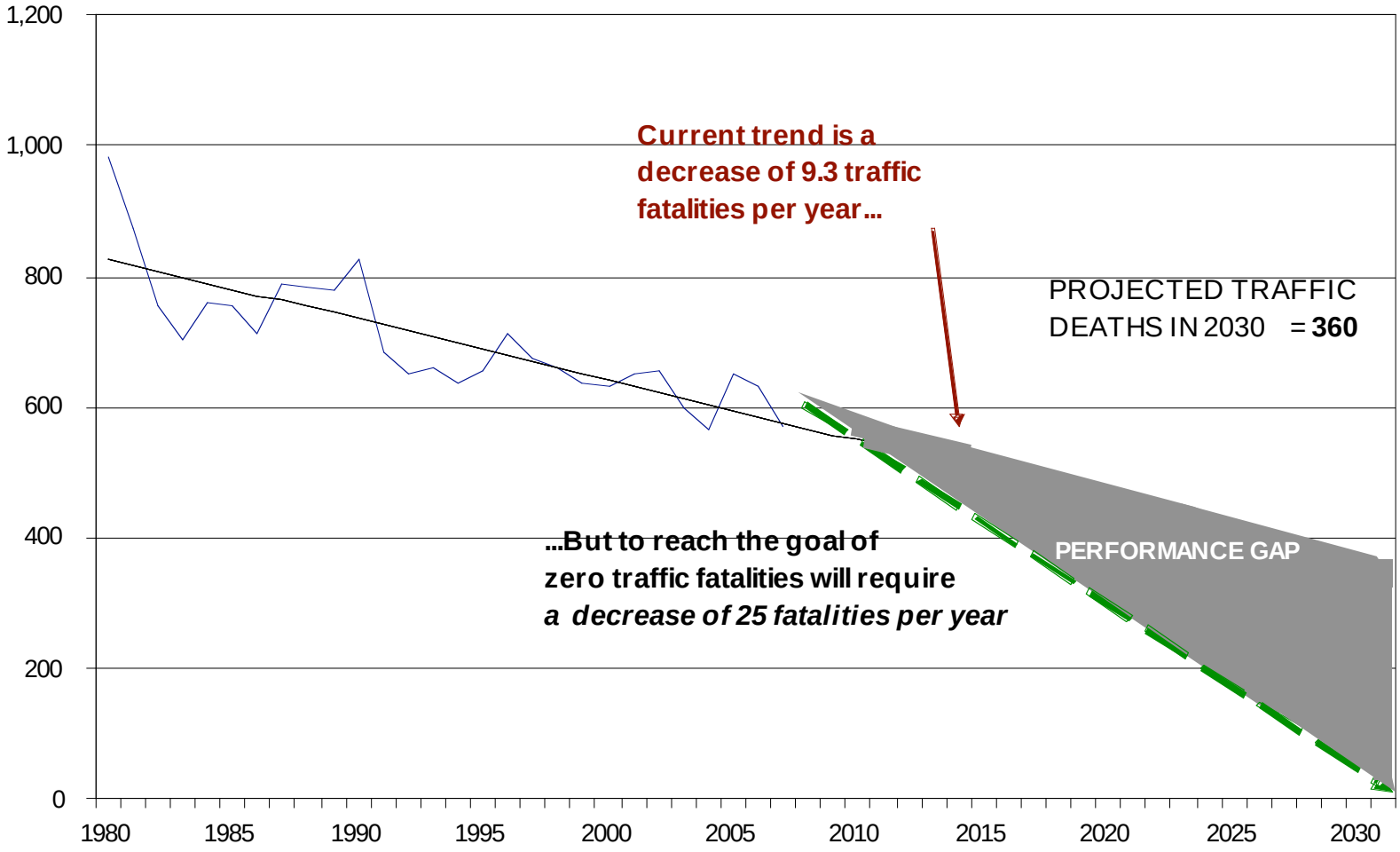
The Target Zero Vision

- Eliminate all Traffic Deaths and Serious Injuries on Washington Roads by The Year 2030.

Washington Traffic Fatalities, 1980-2007

Projected to 2030 **(preliminary data for 2007)**

PREPARED BY WTSC - October 2008 *(Source: FARS)*



Key Elements of Target Zero

- Many partners
- Data based
- State goals and priorities
- Proven strategies

Crash Analysis and Problem Identification

Fatal & Serious Injury Crashes (2002 -2006)

- Rural = 5,255 (36%)
  - State Routes (Interstate) = 423
  - State Routes (non-Interstate) = 2,424
  - County Roads = 2,173
  - City Streets = 235
- Urban = 9,240 (64%)
  - State Routes (Interstate) = 845
  - State Routes (non-Interstate) = 2,223
  - County Roads = 1,453
  - City Streets = 4,719

Fatal & Serious Injury Crashes per Centerline Mile

- **Rural = 0.126 (41,603 miles)**
  - State Routes (Interstate) = 467 miles
  - State Routes (non-Interstate) = 5,264 miles
  - County Roads = 33,701 miles
  - City Streets = 2,170 miles
- **Urban = 0.414 (22,294 miles)**
  - State Routes (Interstate) = 297 miles
  - State Routes (non-Interstate) = 1,015 miles
  - County Roads = 6,157 miles
  - City Streets = 14,825 miles

Fatal & Serious Injury Crashes per Million Vehicle Miles Traveled

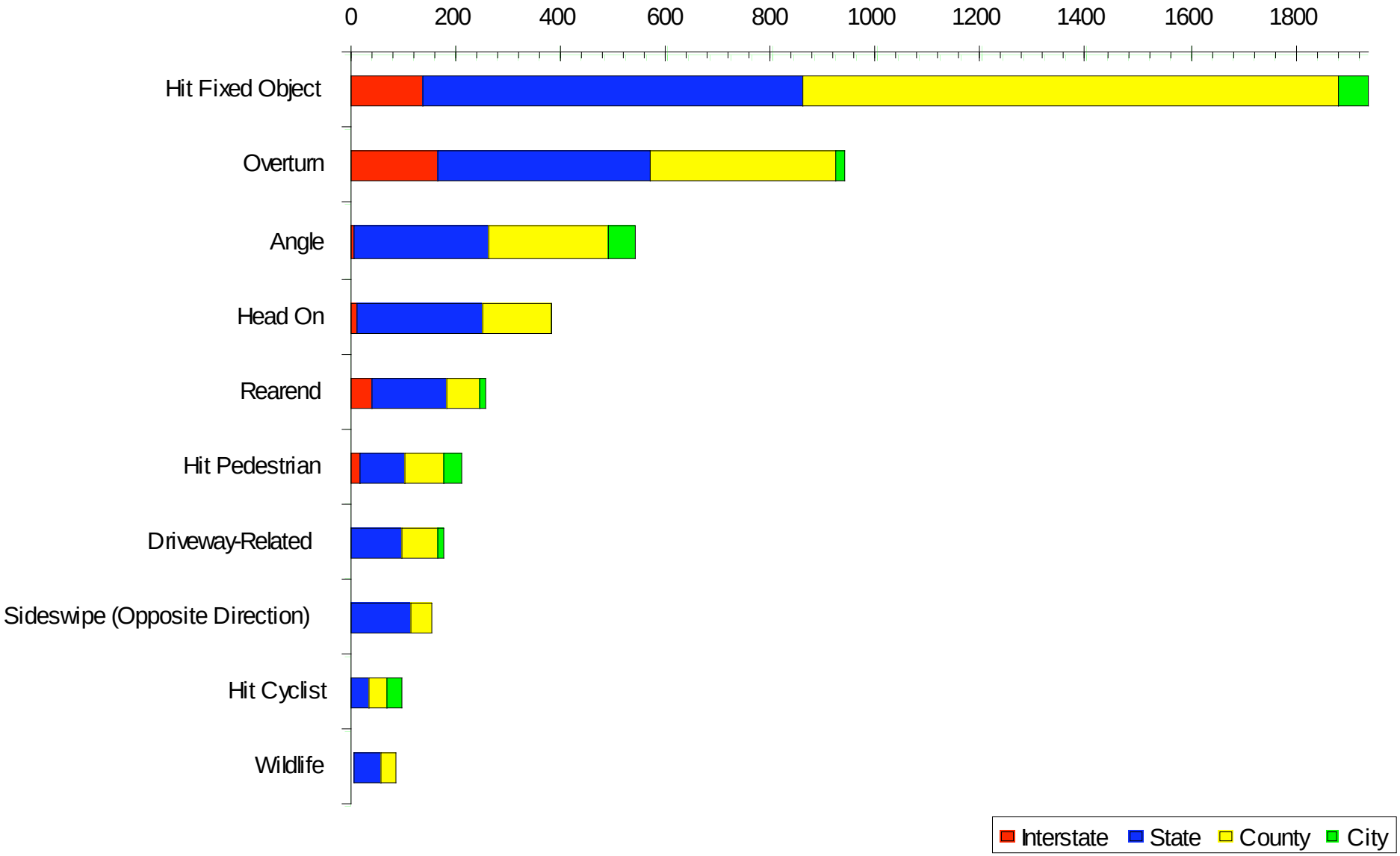
- State Routes (Interstate) = 0.081
  - 33% of fatal/serious collisions are rural
- State Routes (non-Interstate) = 0.283
  - 52% of fatal/serious collisions are rural
- County Roads = 0.393
  - 60% of fatal/serious collisions are rural
- City Streets = 0.328
  - 5% of fatal/serious collisions are rural

Rural Collision Focus

Leading Collision Types

All Rural Roads - Fatal & Serious Injury Collisions

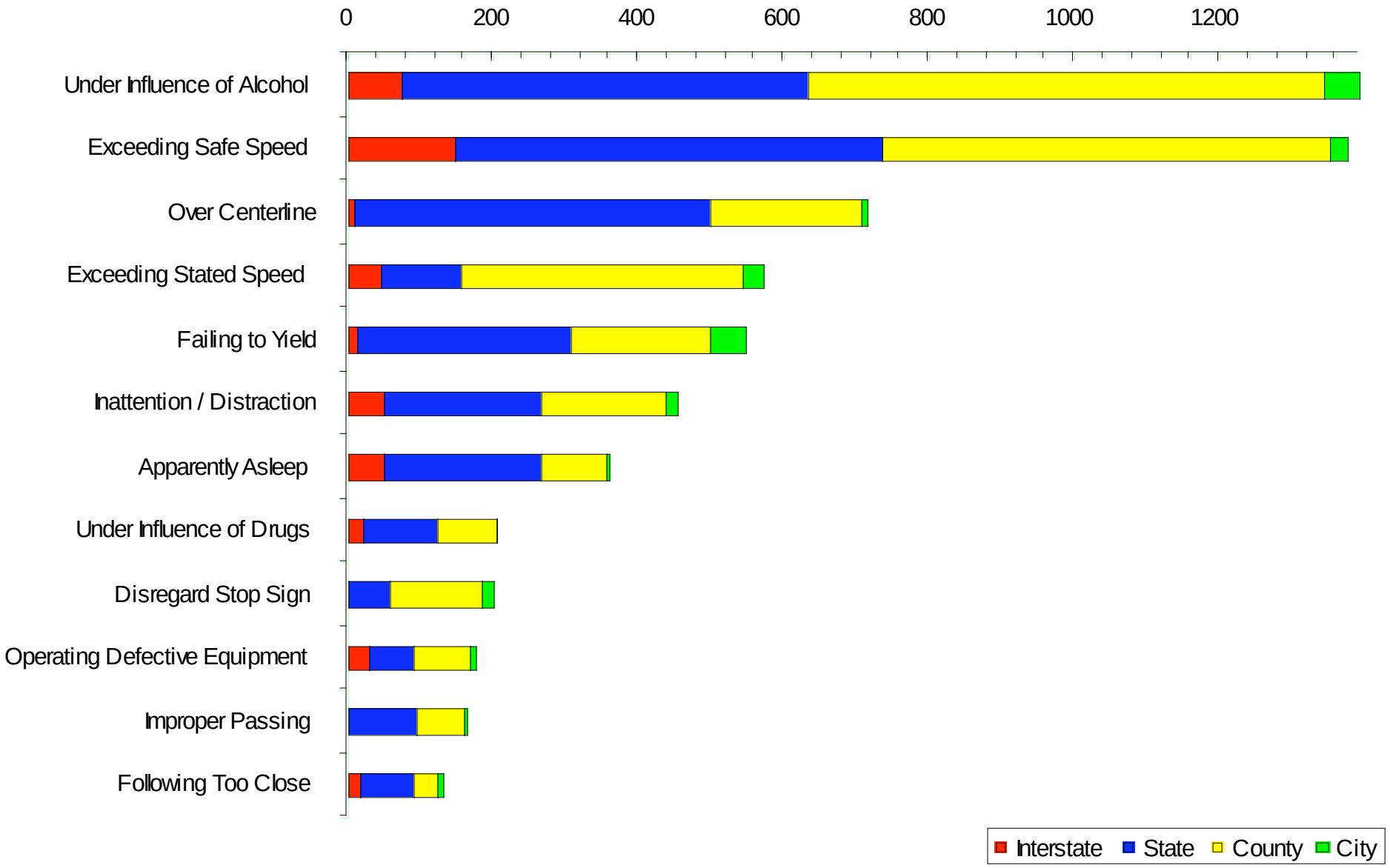
2002-2006



Leading Contributing Causes (# of Drivers)

All Rural Roads - Fatal & Serious Injury Collisions

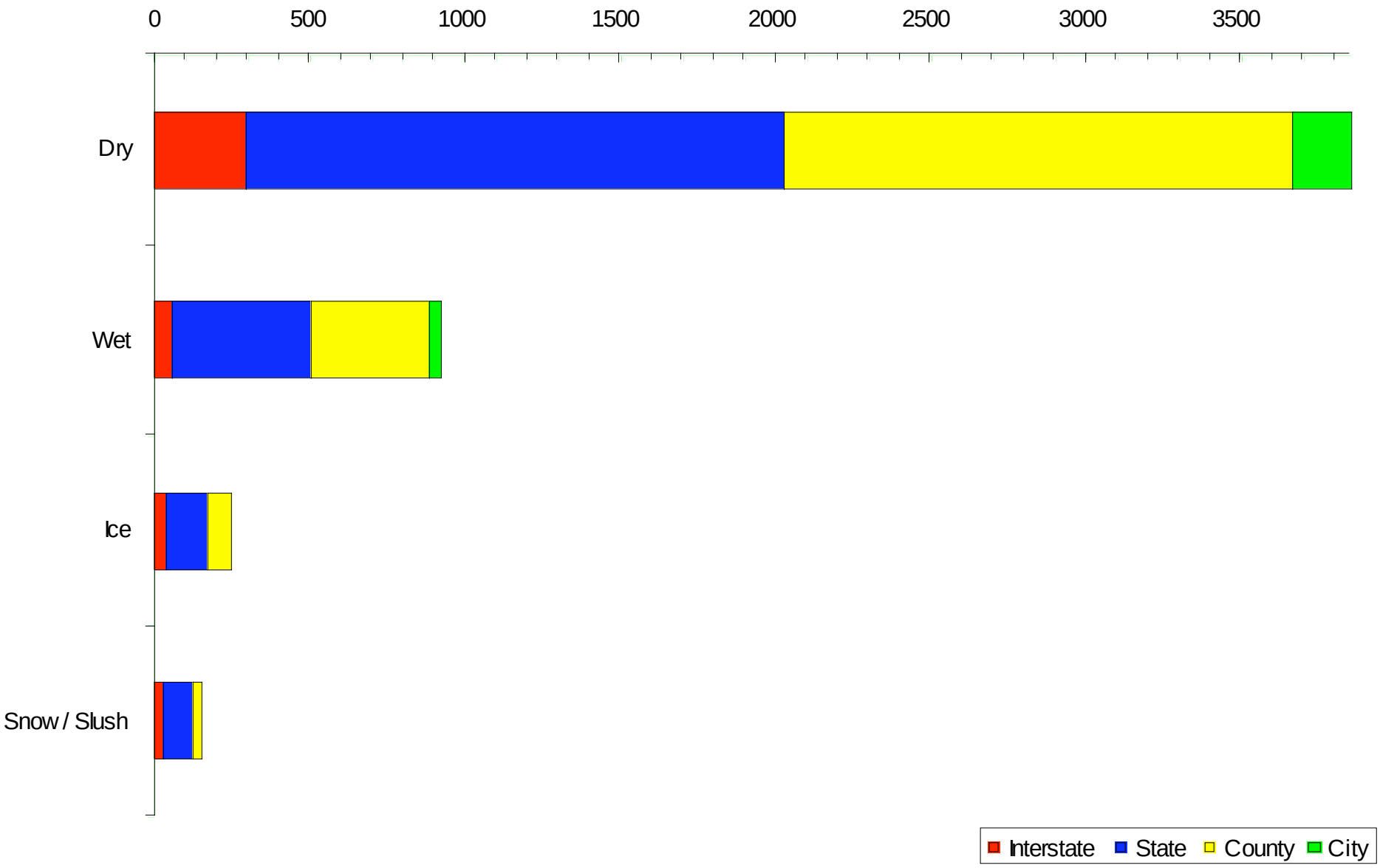
2002-2006



Roadway Surface Conditions

All Rural Roads - Fatal & Serious Injury Collisions

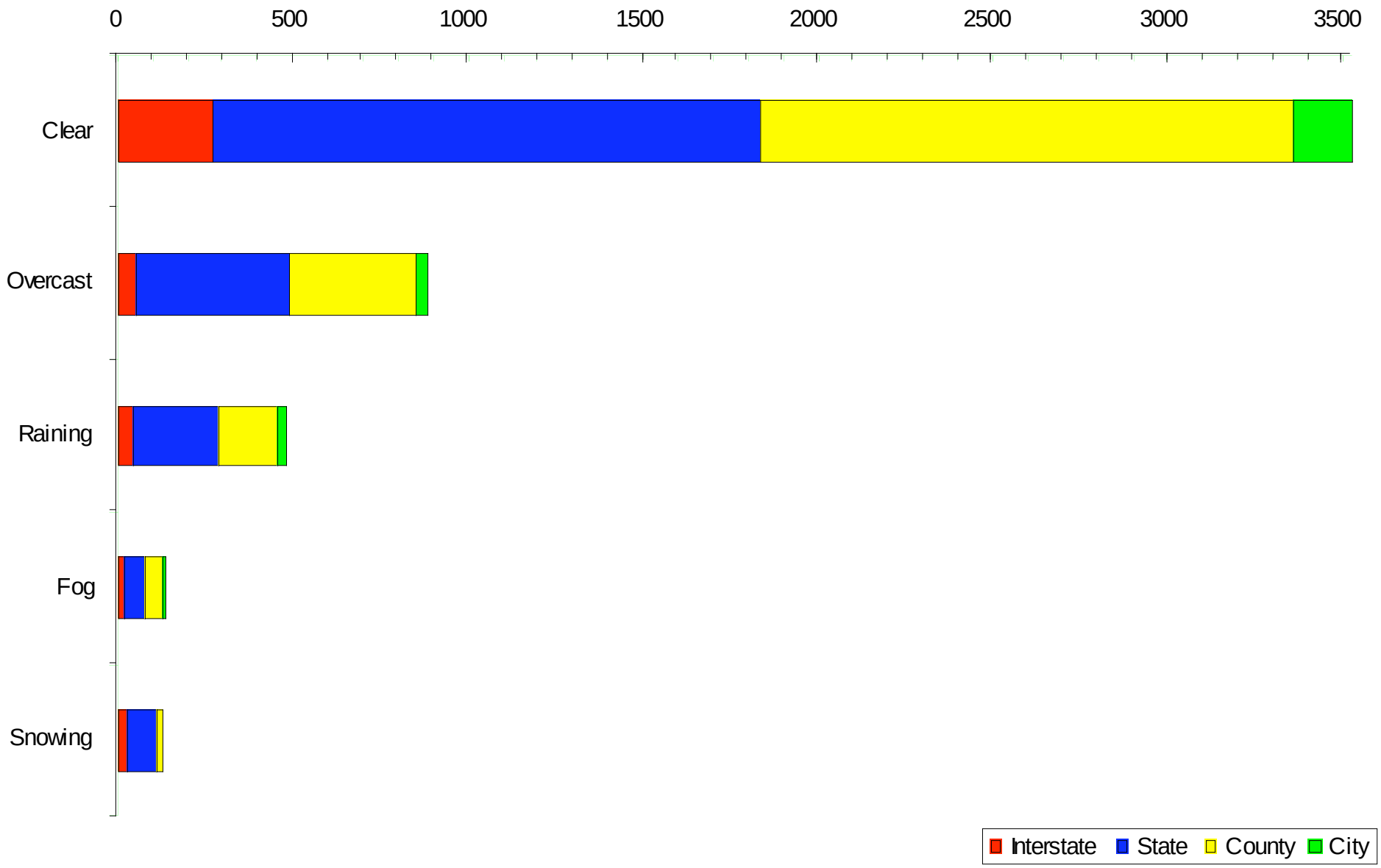
2002-2006



Weather Conditions

All Rural Roads - Fatal & Serious Injury Collisions

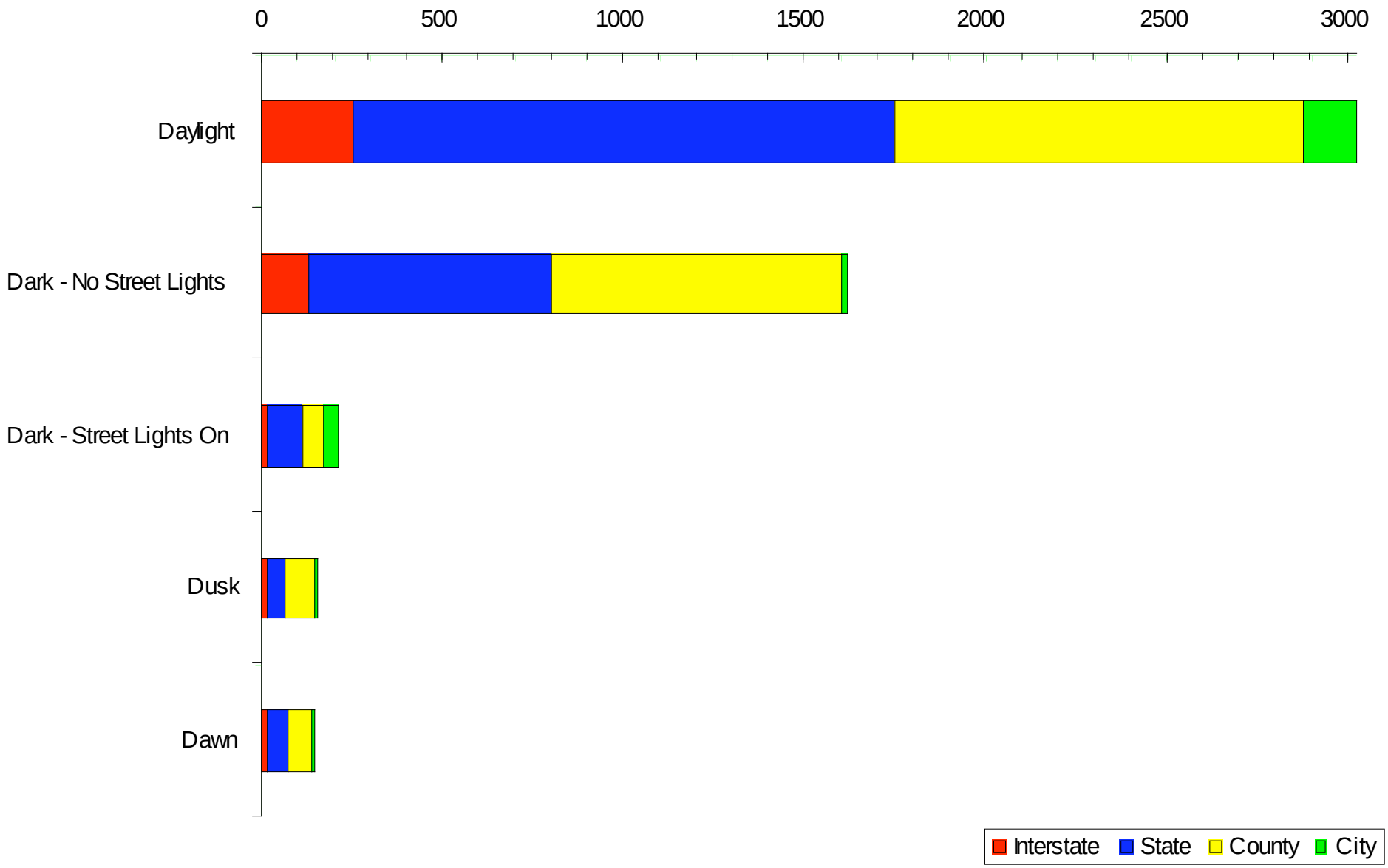
2002-2006



Light Conditions

All Rural Roads - Fatal & Serious Injury Collisions

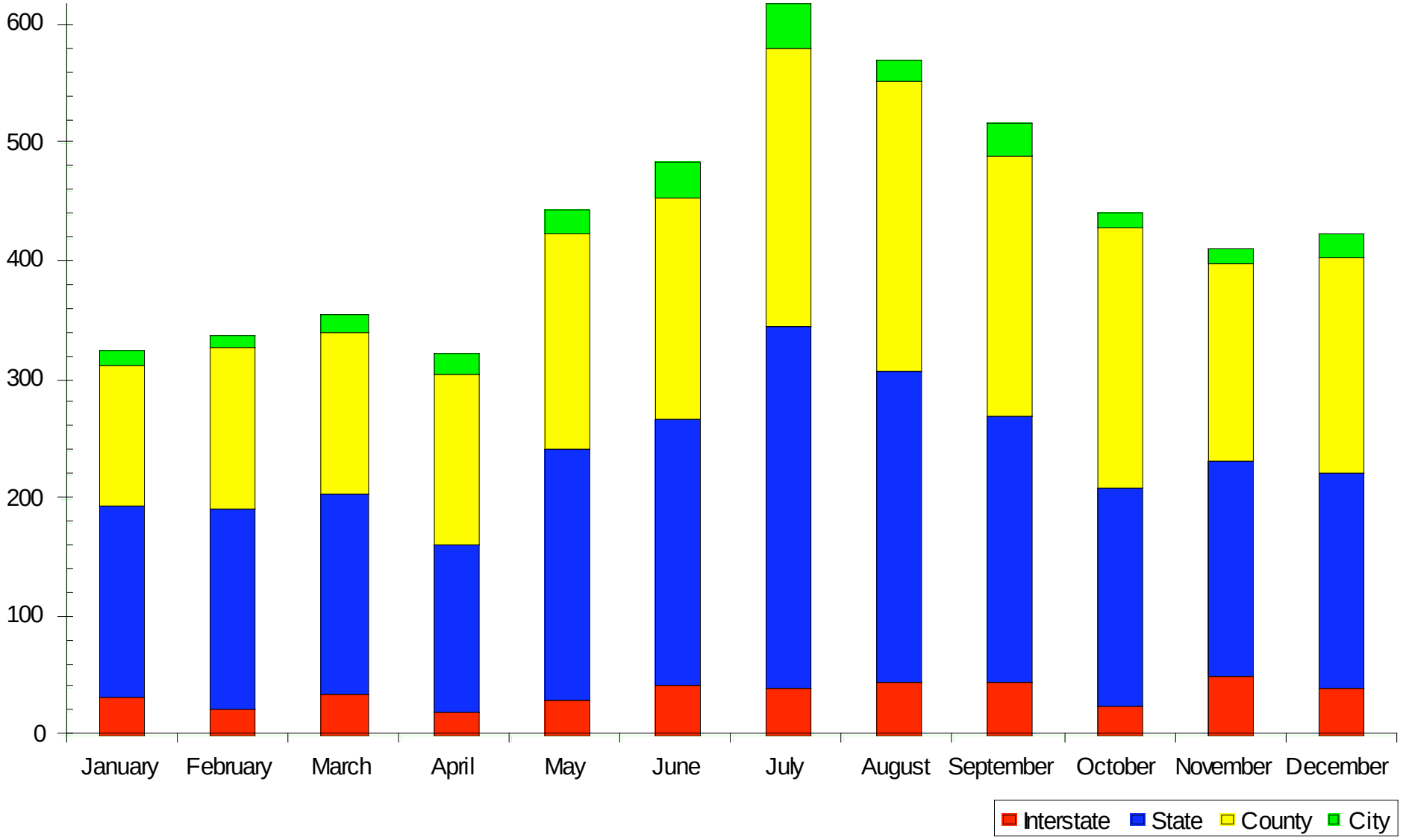
2002-2006



Collisions by Month

All Rural Roads - Fatal & Serious Injury Collisions

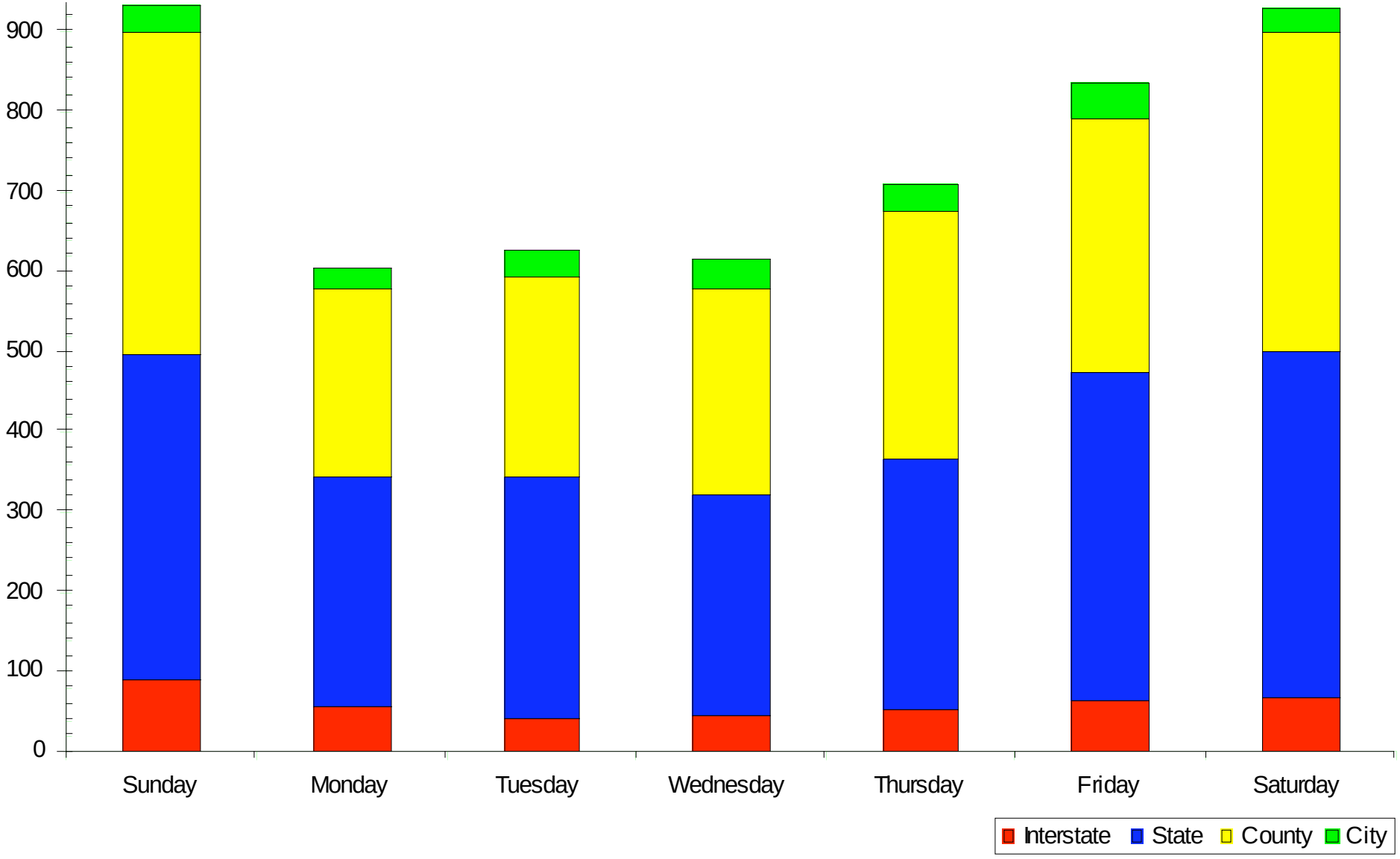
2002-2006



Collisions by Day of Week

All Rural Roads - Fatal & Serious Injury Collisions

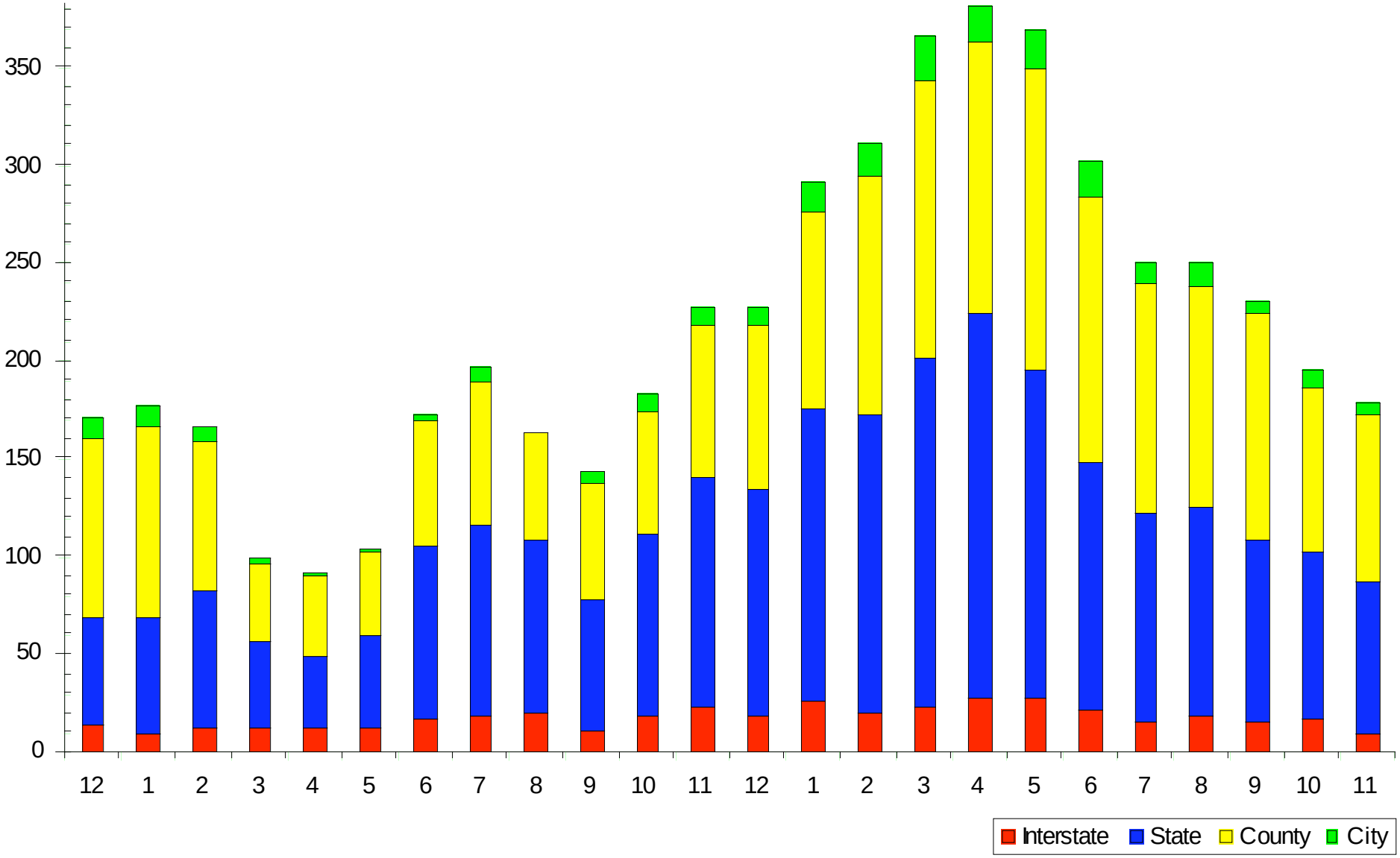
2002-2006



Collisions by Hour of Day

All Rural Roads - Fatal & Serious Injury Collisions

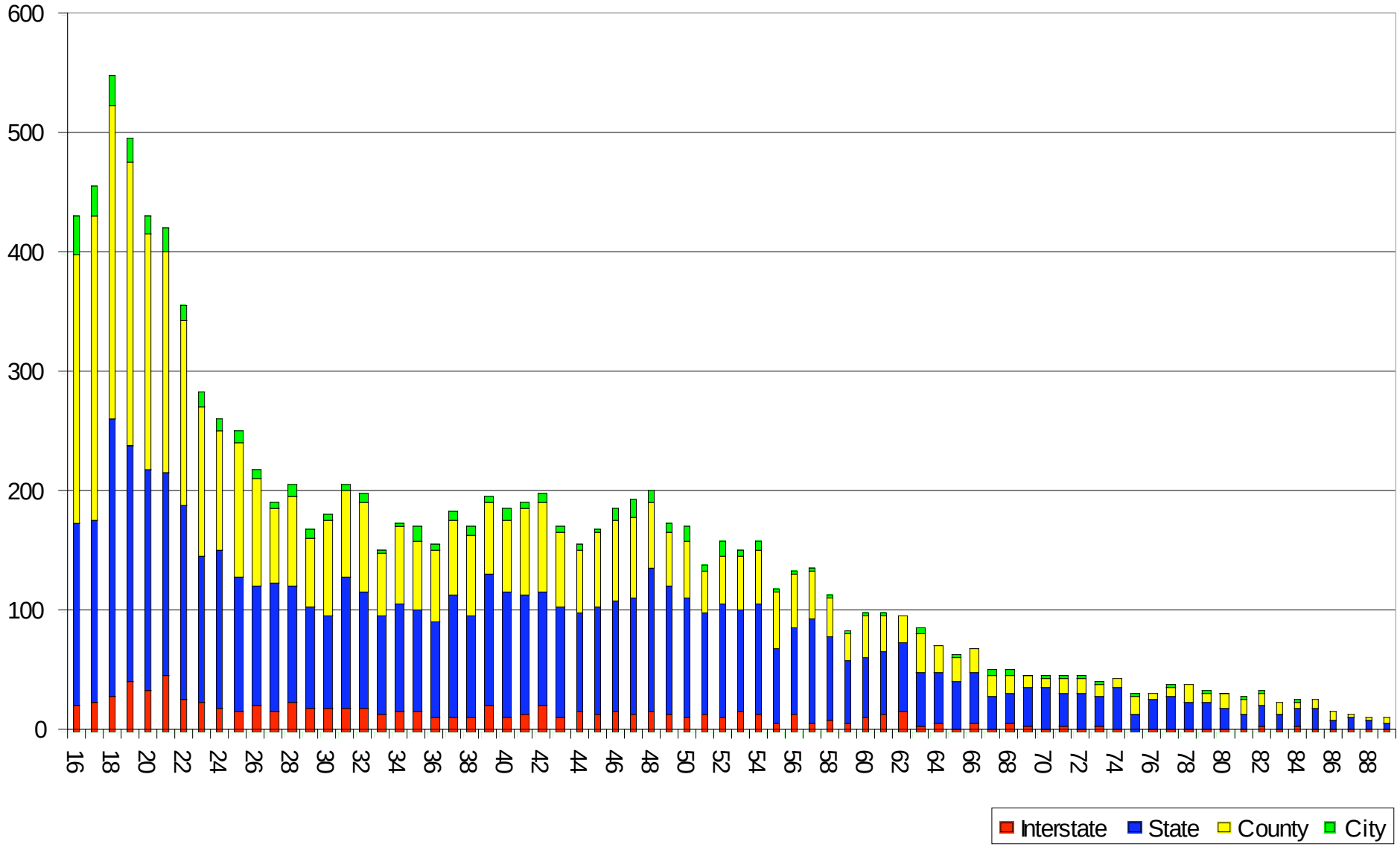
2002-2006



Age of Drivers

All Rural Roads - Fatal & Serious Injury Collisions

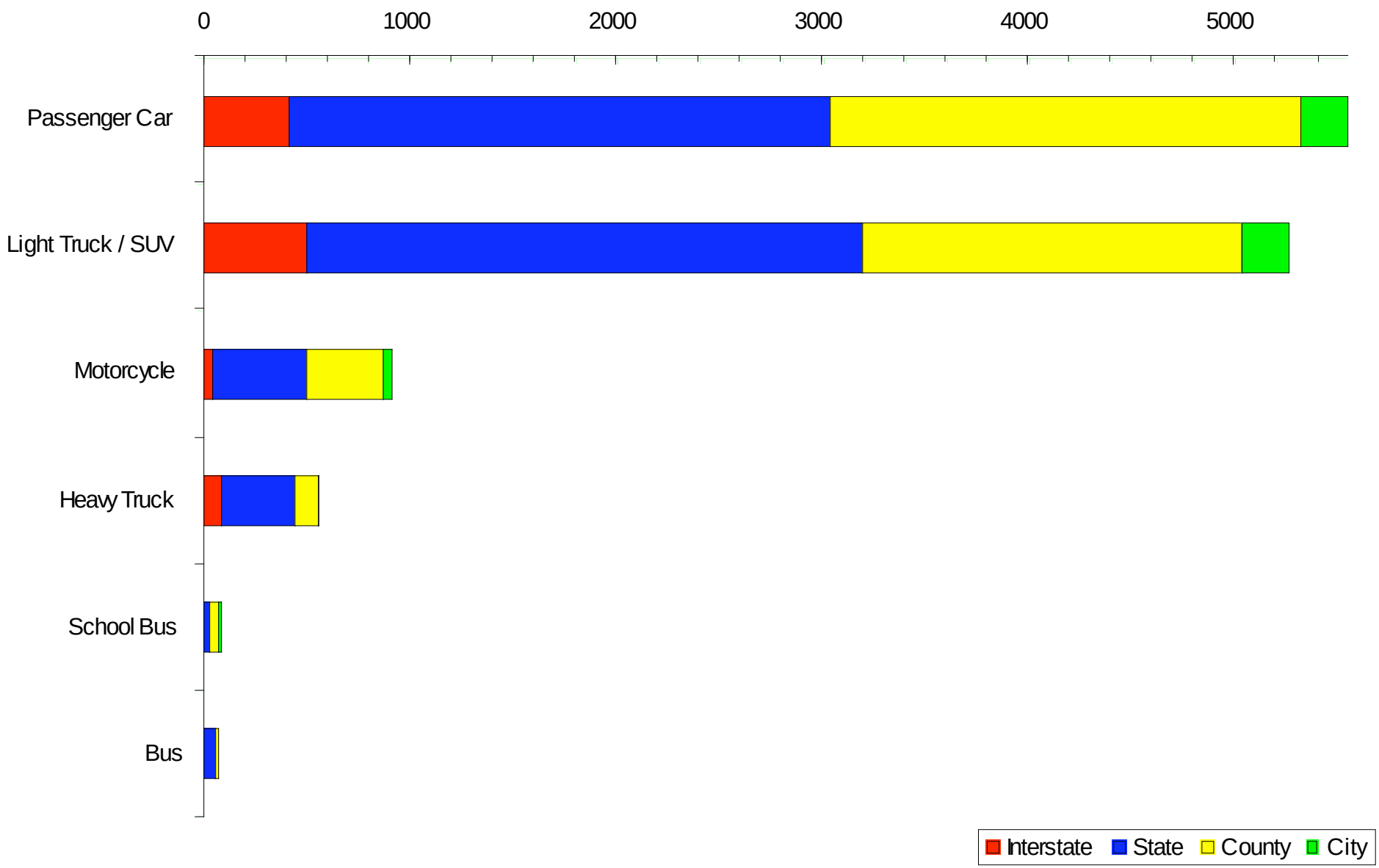
2002-2006



Type of Vehicle

All Rural Roads - Fatal & Serious Injury Collisions

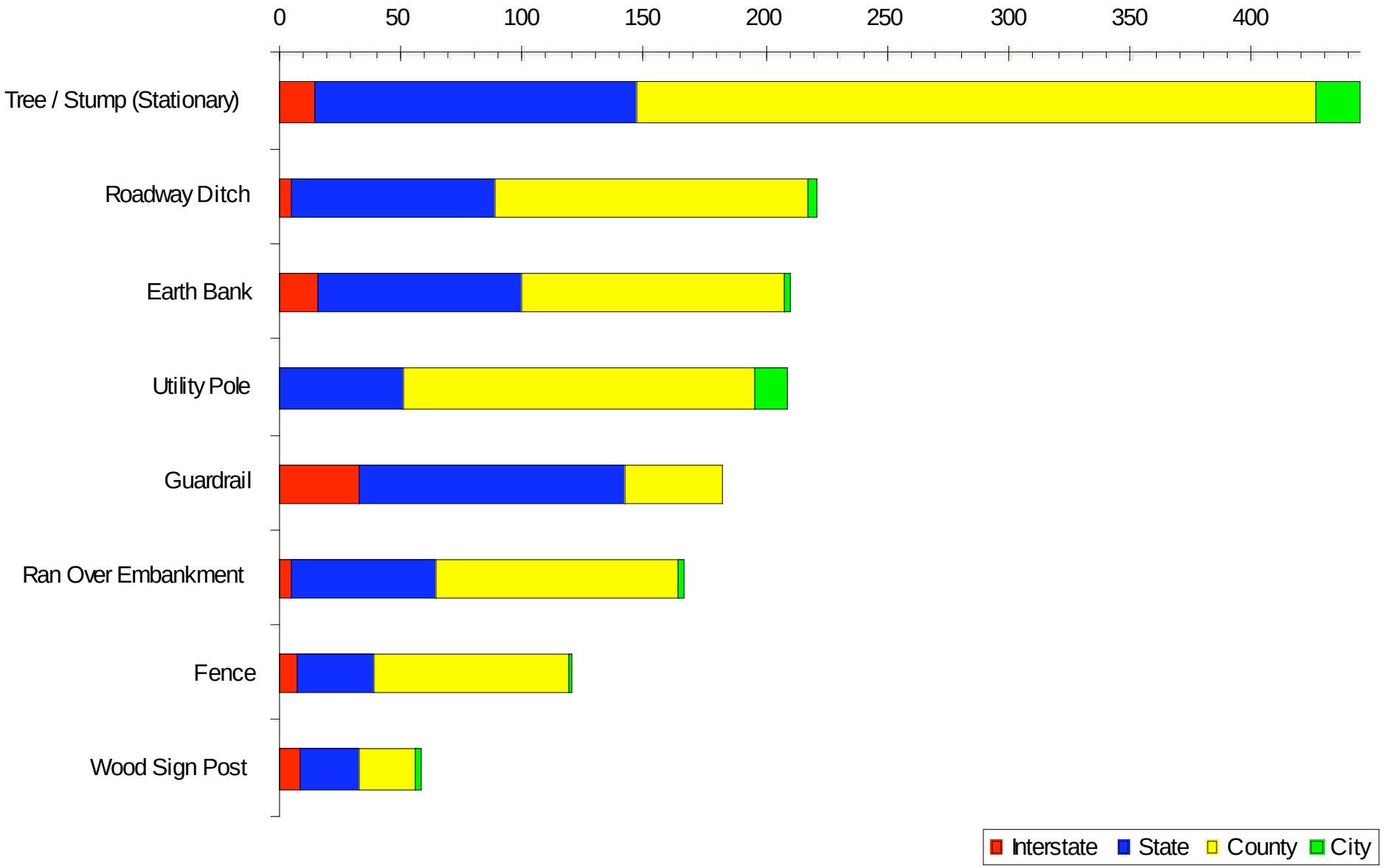
2002-2006



Type of Object Struck (in Hit Fixed Object Collisions)

All Rural Roads - Fatal & Serious Injury Collisions

2002-2006



Target Zero Priorities

Determining Target Zero Priorities

- Analyze the data.
- Target areas where investments will provide the greatest safety benefits.
- Group priority areas into four levels, with priority 1 the most critical.

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Why do People get Hurt or Die in Traffic Crashes?

- Over 80% of traffic deaths result from behavioral errors.

- In Washington, 4 out of every 5 traffic deaths involve impairment, speed, or non-belt use or some combination of the three factors.

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Priority One

- **Impaired Driving**
- **Speed**

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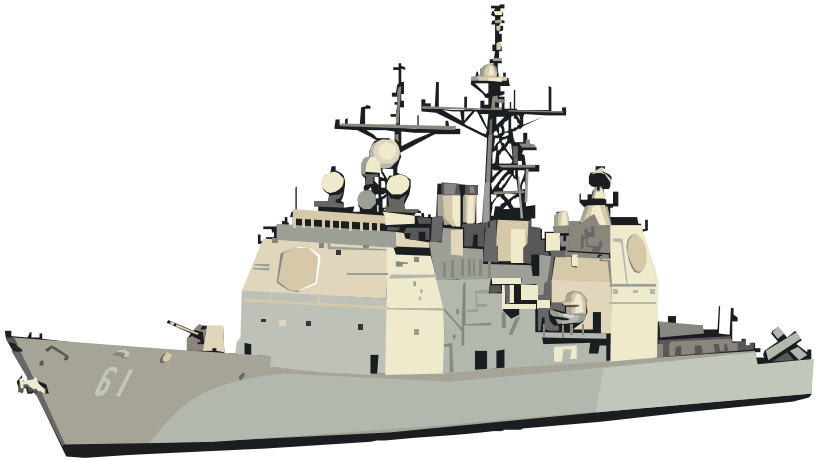
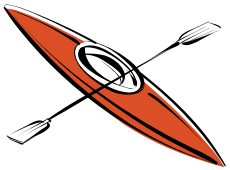
Priority Two

- Run off the Road Crashes
- Intersection Crashes
- Occupant Protection (Seat Belts and Child Safety Seats)
- Traffic Records System Improvements

A high Tide Floats All Boats





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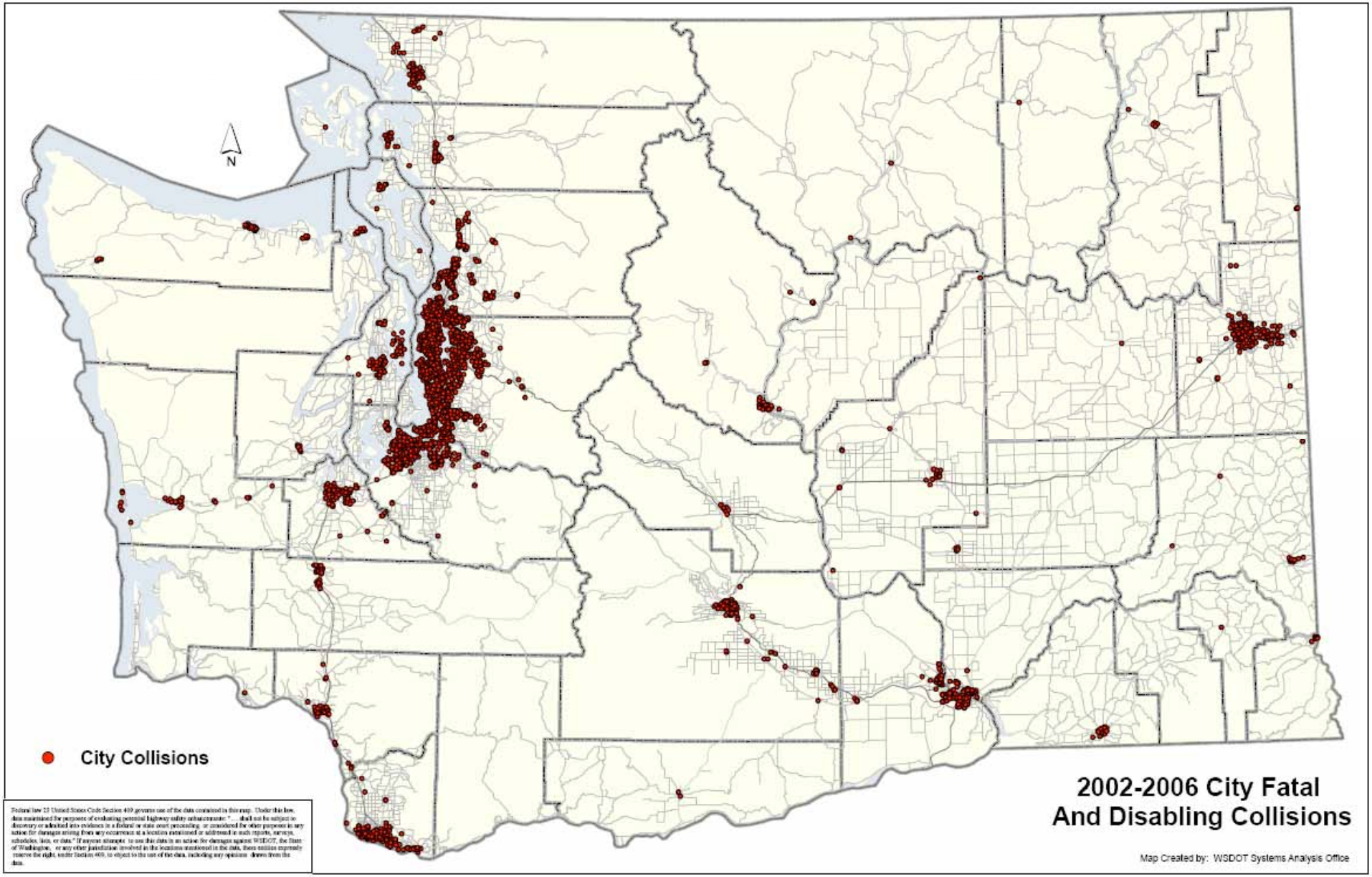
Engineering Strategies – WSDOT Highways & Local Programs

- Research
  - Highway Safety Issues Group (HSIG) Rural Road Safety Subcommittee
- Funding
  - Highway Safety Improvement Program
  - High Risk Rural Roads Program

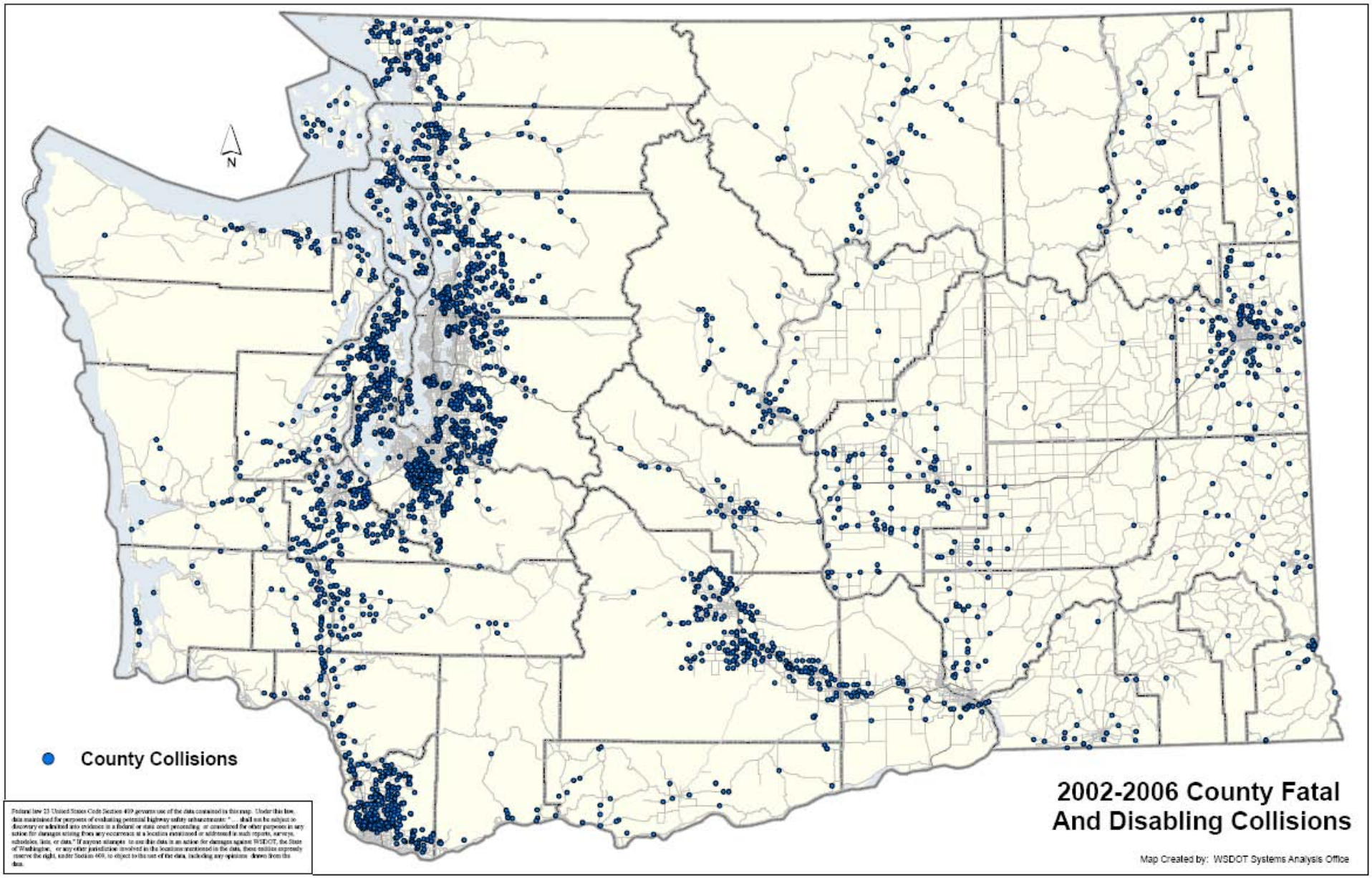
Research

- HSIG subcommittee formed in 2007
  - Includes WSDOT, FHWA, CRAB
- Evaluating current strategies
- Identifying/pursuing research needs
- Identifying new methodology/process needs

City Streets Fatal & Serious (02-06)



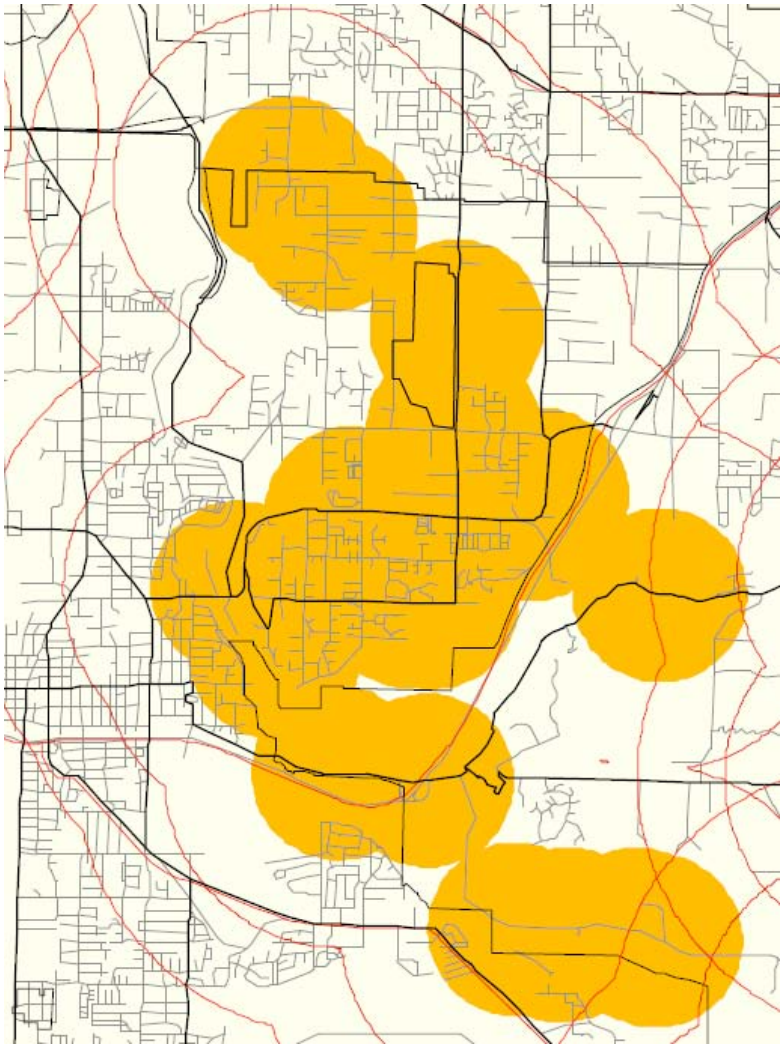
County Roads Fatal & Serious (02-06)

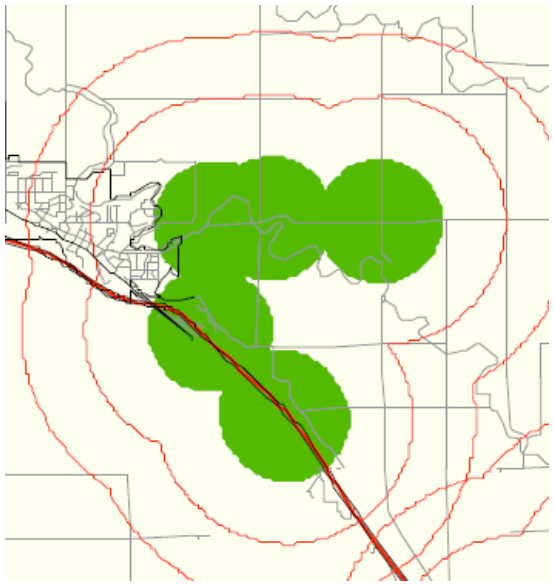


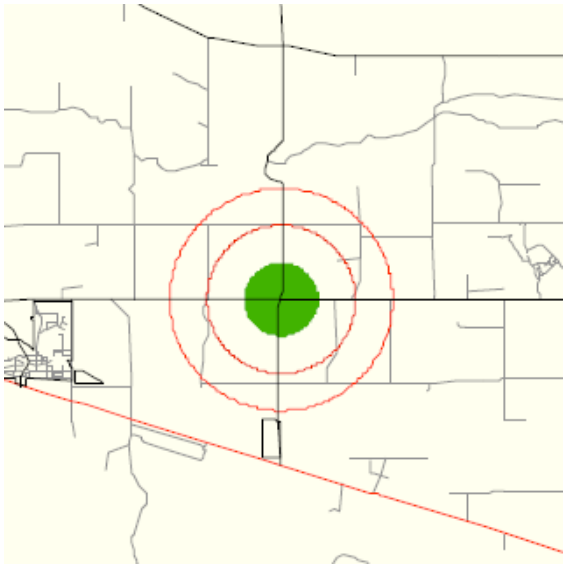
Funding (Rural)

- Highway Safety Improvement Program (HSIP)
  - Based on crash history
  - Funding provided to counties for urban & rural locations
- Locations identified by concentrations of fatal & serious injury collisions
  - 4 collisions in 5 years
  - No more than a one mile gap between crash locations

Funding (cont.)





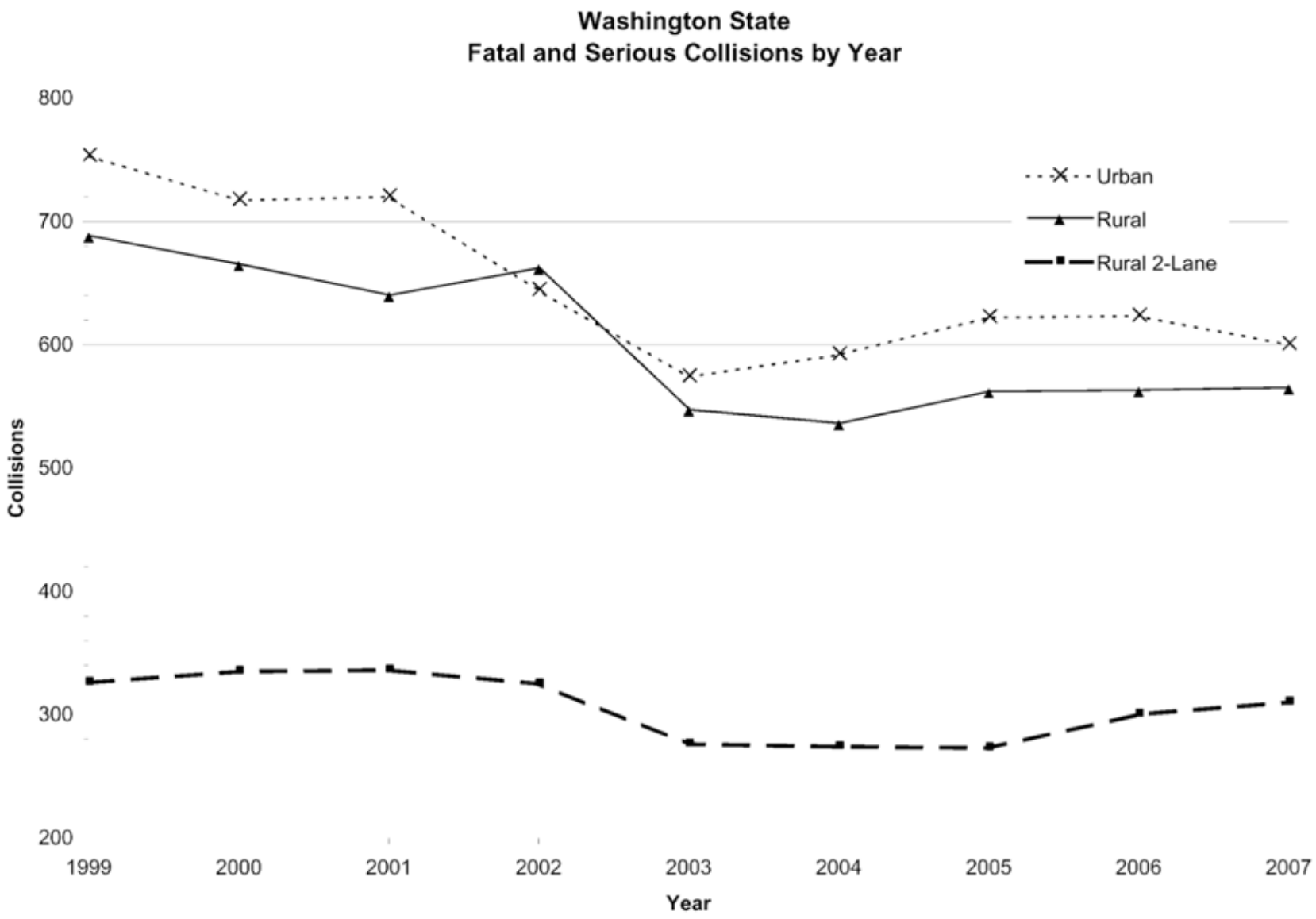


Funding (cont.)

- High Risk Rural Roads Program (HRRRP)
- Based on risk
- Focused on run-off-road collisions (54% of all fatal & serious crashes on county roads)
- Funding provided to counties for low-cost, widespread safety improvements

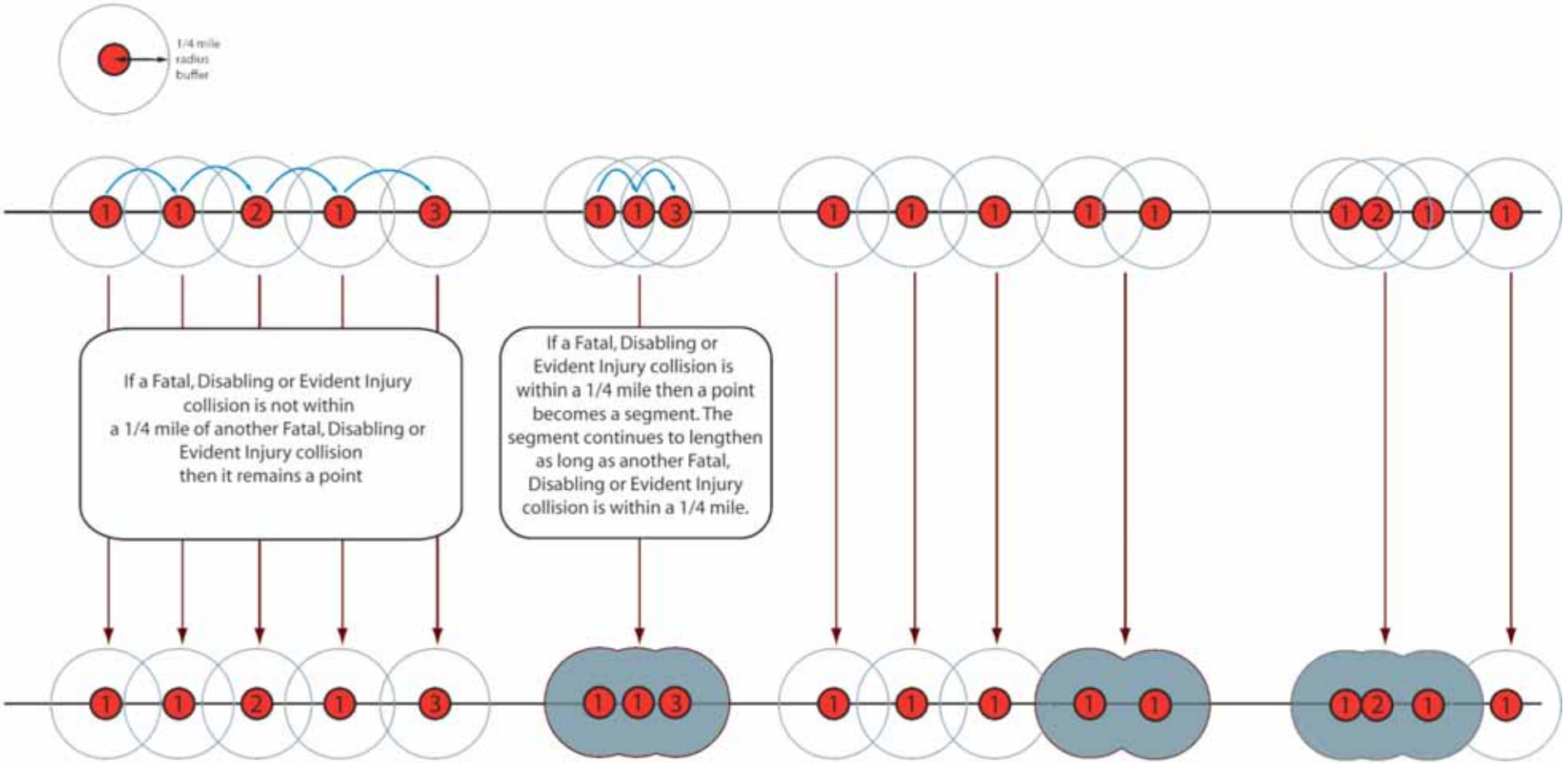
Analysis Steps for Identifying Safety Needs on State Highways

- Check collision numbers against performance goal of "Target Zero"
- Identify locations of concentrated fatal and serious injury collisions
- Identify corridors of with large numbers of dispersed fatal and serious collisions
- Identify collision type and contributing circumstances for concentrated and dispersed collisions
- Work with Target Zero partners to identify strategic solutions
- Track effectiveness of safety strategies


Washington State
Fatal and Serious Collisions by Year
800
700
600
500
400
300
200
Collisions
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year
Urban
Rural
Rural 2-Lane

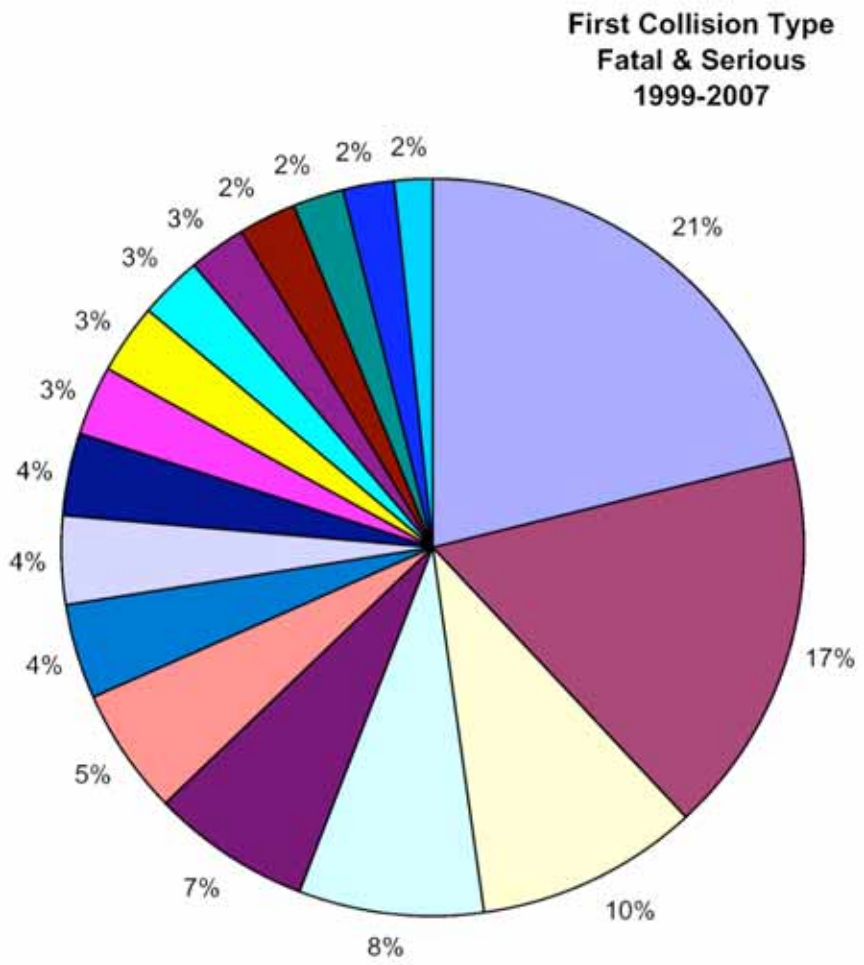
Methodology of Collision Analysis

This analysis was performed in MS Excel and is graphically illustrated to provide a general understanding and link to ArcMAP GIS software.



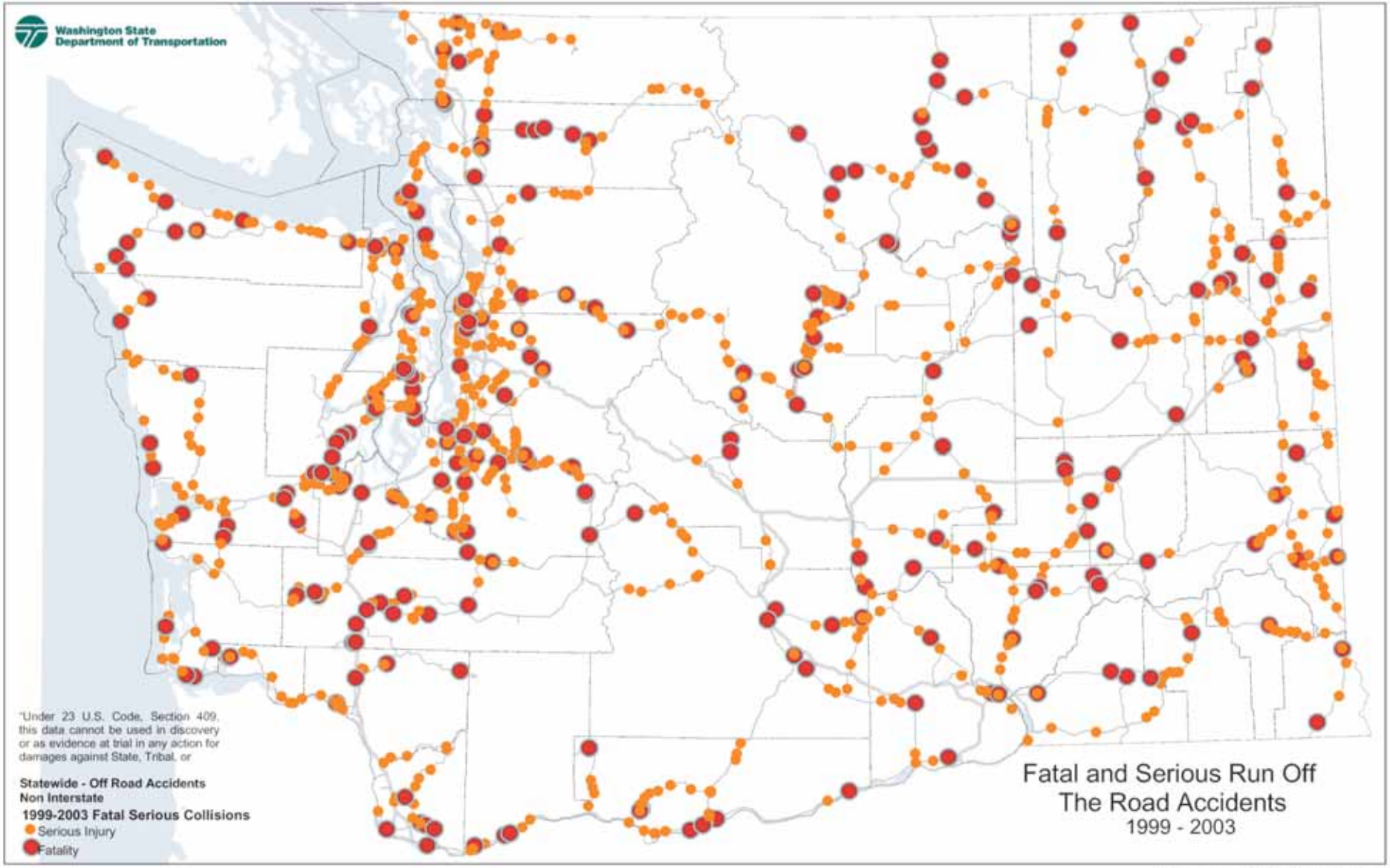
Federal law 23 USC section 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for Federal safety improvement funding.

Washington State Rural 2-Lane Roadways

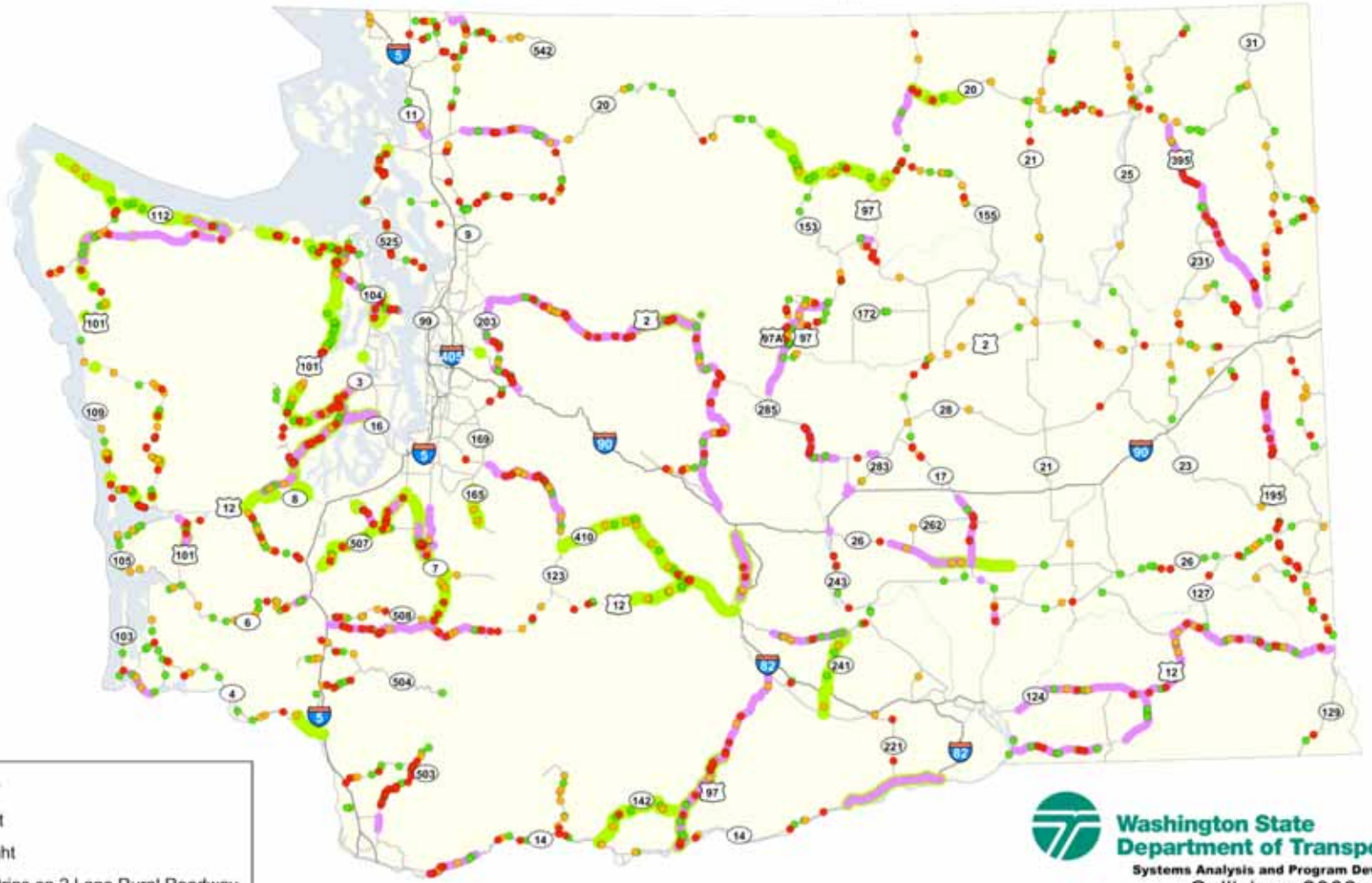


- All other (809)
- From opposite direction - both moving - head-on (650)
- From opposite direction - all others (370)
- Entering at angle (299)
- Tree or Stump (stationary) (270)
- From opposite direction - both going straight - sideswipe (210)
- Earth Bank or Ledge (164)
- From same direction - both going straight - one stopped - rear-end (143)
- Roadway Ditch (137)
- Guardrail - Face (125)
- One car entering driveway access (110)
- Over Embankment - No Guardrail Present (110)
- From same direction - both going straight - both moving - rear-end (96)
- Vehicle going straight hits pedestrian (94)
- From opposite direction - one left turn - one straight (84)
- Utility Pole (81)
- Non-domestic animal (deer, bear, elk, etc) (68)

Washington State Department of Transportation
Systems Analysis & Program Development
12/11/08
cpe


Washington State
Department of Transportation
"Under 23 U.S. Code, Section 409, this data cannot be used in discovery or as evidence at trial in any action for damages against State, Tribal, or
Statewide - Off Road Accidents
Non Interstate
1999-2003 Fatal Serious Collisions
Serious Injury
Fatality
Fatal and Serious Run Off
The Road Accidents
1999 - 2003
WJO/statewideOFFROADACC98-03.mxd

Run Off The Road (ROTR) and Crossover Collisions
Rural Two-Lane Roadways



- Crossover
- ROTR Left
- ROTR Right
- Rumble Strips on 2 Lane Rural Roadway
- Roadside Risk projects

"Under 23 U.S. Code, Section 409, this data cannot be used in discovery or as evidence at trial in any action for damages against State, Tribal or Local Government that involves the locations mentioned in this data."

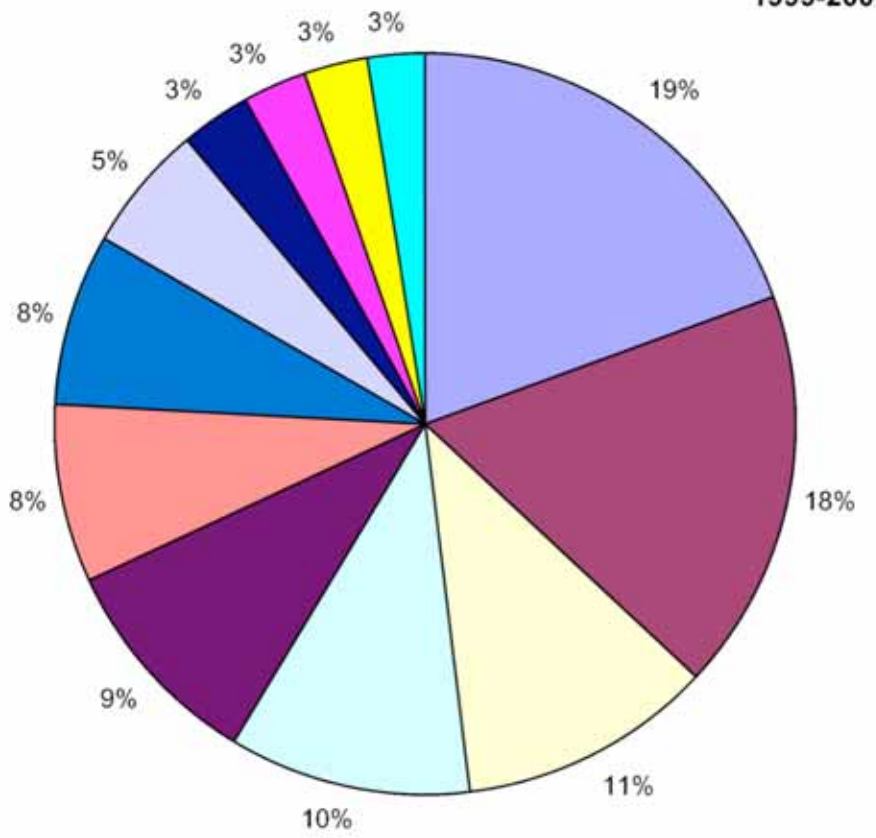
Washington State Department of Transportation
Systems Analysis and Program Development

Collisions 2003 - 2007
Collisions are non-directional

rpsrtural_rotr_crossover.mxd

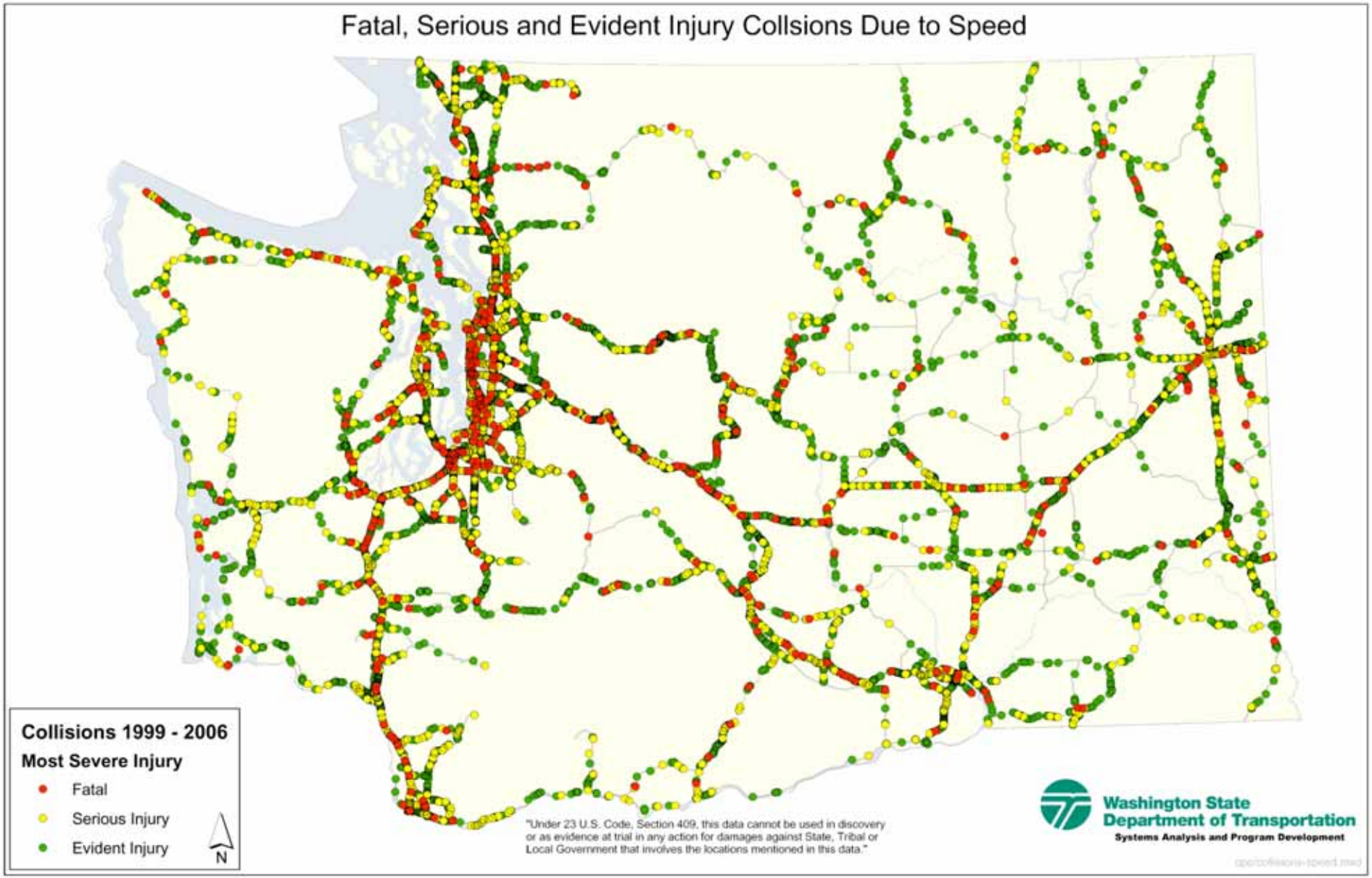
Washington State Rural 2-Lane Roadways

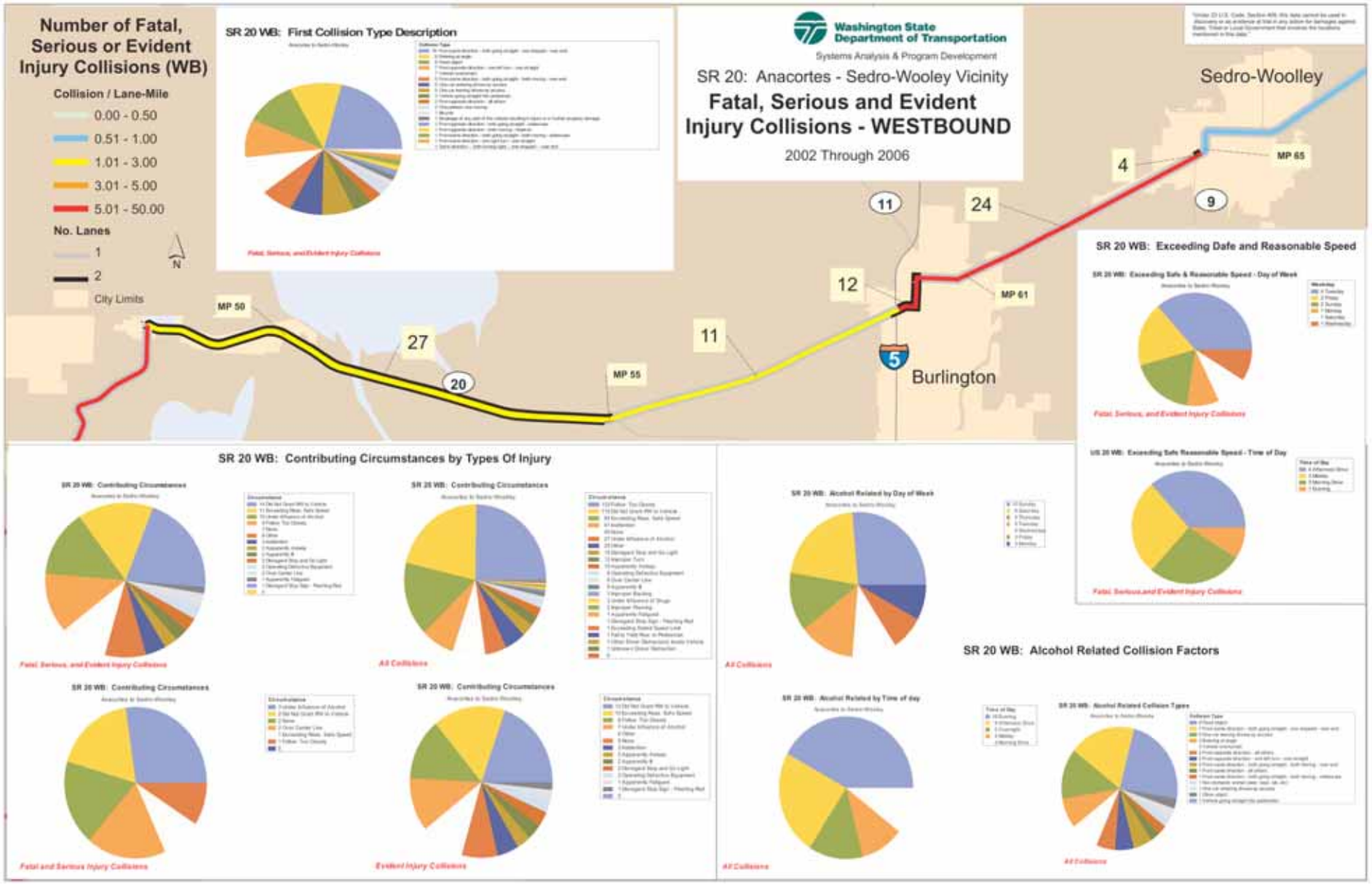
Contributing Circumstance
Fatal & Serious
1999-2007



Washington State Department of Transportation
Systems Analysis & Program Development
12/11/08
cpe

Fatal, Serious and Evident Injury Collsions Due to Speed




Number of Fatal, Serious or Evident Injury Collisions (WB)
Collision / Lane-Mile
0.00 - 0.50
0.51 - 1.00
1.01 - 3.00
3.01 - 5.00
5.01 - 50.00
No. Lanes
1
2
City Limits
N
SR 20 WB: First Collision Type Description
Fatal, Serious, and Evident Injury Collisions
Washington State Department of Transportation
Systems Analysis & Program Development
SR 20: Anacortes - Sedro-Wooley Vicinity
Fatal, Serious and Evident Injury Collisions - WESTBOUND
2002 Through 2006
Sedro-Woolley
Burlington
MP 50
MP 55
MP 61
MP 65
20
27
11
12
24
4
9
5
SR 20 WB: Exceeding Dafe and Reasonable Speed
SR 20 WB: Exceeding Safe & Reasonable Speed - Day of Week
Fatal, Serious, and Evident Injury Collisions
US 20 WB: Exceeding Safe Reasonable Speed - Time of Day
Fatal, Serious,and Evident Injury Collisions
SR 20 WB: Contributing Circumstances by Types Of Injury
SR 20 WB: Contributing Circumstances
Fatal, Serious, and Evident Injury Collisions
SR 20 WB: Contributing Circumstances
All Collisions
SR 20 WB: Contributing Circumstances
Fatal and Serious Injury Collisions
SR 20 WB: Contributing Circumstances
Evident Injury Collisions
SR 20 WB: Alcohol Related by Day of Week
All Collisions
SR 20 WB: Alcohol Related Collision Factors
SR 20 WB: Alcohol Related by Time of day
All Collisions
SR 20 WB: Alcohol Related Collision Types
All Collisions


228
227
226
225
224
223
222
221
220
219
218
971
97A
97
Chelan County
Douglas County
End Project
Begin Project
X
LR
Fatal, Serious or Evident Injury Collisions
Fatality
Serious Injury
Evident Injury
X = Crossover
RR = ROTR Right
RL = ROTR Left
Roadway Shoulder, 2007
None
1 - 3 Feet
4 - 6
7 - 10
> 10 feet
N
Washington State Department of Transportation
Systems Analysis and Program Development
US 97A - Chelan Falls
Add Passing Lane
Mileposts 223.30 to 223.63
Fatal, Serious and Evident Injury Collision Corridors
2003 Through 2007

Highway Safety Annual Update

Keeping citizens safe on Washington's highways is a top priority for WSDOT and the Governor. Washington State's *Strategic Highway Safety Plan, Target Zero*, outlines the goal to achieve zero traffic deaths and zero disabling injuries by the year 2030. In order to achieve this goal, the state must decrease traffic fatalities by 24 each year between 2005 and 2030.

WSDOT plays a key role in the statewide effort to achieve this goal. In order to demonstrate the effectiveness of strategies to improve highway safety, WSDOT collects and analyzes highway traffic incident data. This edition of the *Gray Notebook* presents the 2007 Before and After Safety Project Study, annual updates on pedestrian and bicycle fatalities and safety, and an update on the statewide guardrail and bridge rail retrofit programs.

Annual Before and After Safety Project Study

Each year, WSDOT completes a variety of safety improvement projects throughout the state highway system, ranging from adding turn lanes and traffic signals, to installing median barriers and rumble strips. As part of a continuing effort to determine the effects of these projects on reducing the number and severity of traffic collisions, WSDOT has conducted its fifth annual Before and After Safety Study.

Forty-Nine Before and After Projects Result in a 19% Reduction in all Injury and Fatal Collisions

Forty-nine projects resulted in a 6% reduction (73 collisions) for all types of collisions (1,118 compared to 1,191), and a 19% reduction (97 collisions) in all injury/fatal collisions (407 compared to 504). The number of property damage only collisions increased by 3% (24 collisions) for the same projects (711 from 687). Similar to the last report concerning safety projects, this report also states the results on collisions with serious injuries and fatalities. This information was included to show how safety enhancement projects are complementing the state's efforts to achieve *Target Zero*, the basis of Washington State's Strategic Highway Safety Plan. The plan was developed to identify Washington State's traffic safety needs and to guide investment decisions in order to achieve significant reductions in traffic fatalities and serious injuries.

Analysis shows that implementing these 49 projects have reduced fatal and serious injury collisions by 14% (5 collisions), which is 26 fatal and serious injury collisions in the after period versus 31 in the before period. Although the reduction figure for the "All Types" category is low, and the "Property Damage Only" category experienced an increase, the reduction in injury and fatal collisions, and more specifically the serious and fatal collisions, are in the 14% to 19% reduction range.

The date range for all completed projects used within the study is October 1, 2003 through September 30, 2005. This made it possible for each project to have 24 or 36 months of available before and after data. At the time of this study, the most current

Before and After Results for All 49 Safety Projects

Collisions Per Year For All Projects

	All Types	Property Damage Only	All Injury/ Fatal	Serious Injury/ Fatal
Before Period	1190.8	687.2	503.7	30.5
After Period	1117.5	710.5	407.0	26.3
Percent Change	-6.2%	3.4%	-19.2%	-13.7%

Source: WSDOT Transportation Data Office

Highlights from the December 31, 2007 Highway Safety Annual Update:

49 Before and After projects result in a 6% reduction for all collisions and a 19% reduction in all injury and fatal collisions; pp. 58-59

Washington State ranked 15th lowest in the nation for pedestrian fatalities in 2006, one spot higher than 2005 (16th ranked); pp. 60-61

Washington State ranked 10th lowest in the nation for bicycle fatalities in 2006 with 7 total fatalities. The state ranked 25th last year; pp. 60-61

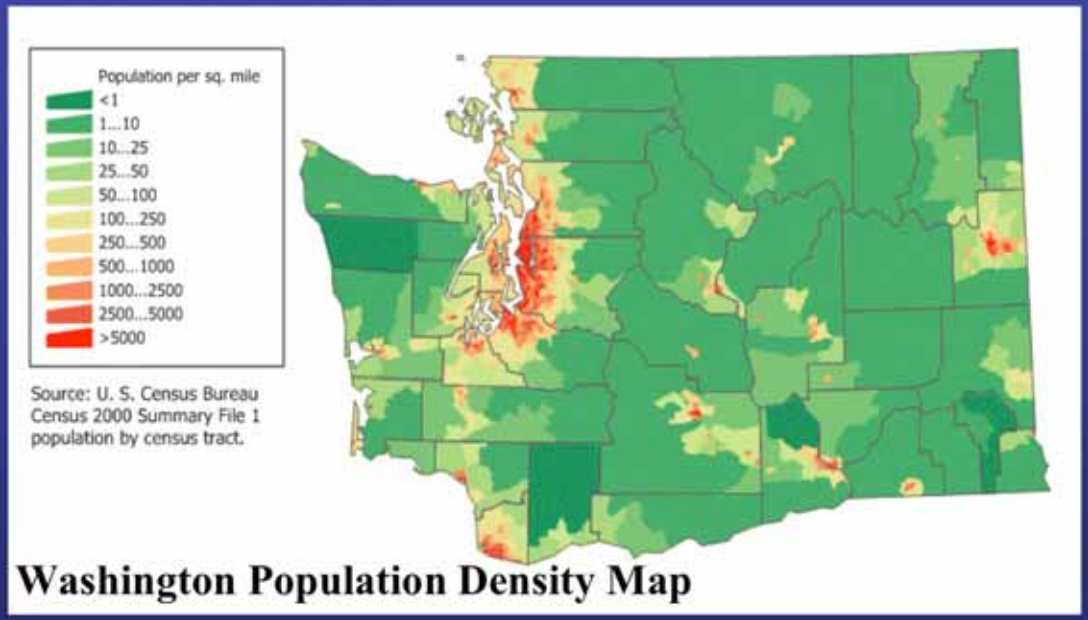
The guardrail retrofit program has replaced nearly 58 miles of nonstandard guardrail statewide as of December 2007; p. 62

Measuring Highway Safety Projects

WSDOT's safety projects are classified into two categories: collision reduction and risk prevention. Risk prevention projects improve roadways to lessen the risk of future collisions. As such, these types of projects typically do not show a significant decrease in collision results in Before and After studies. In the June 30, 2006 *Gray Notebook*, it was mentioned that Before and After collision reduction numbers may "level off" as WSDOT implements more risk prevention type projects. This study does reflect lower reduction percentages. WSDOT is still exploring performance measurement methods for better assessing the impacts of risk prevention type of projects.

Behavioral Strategies

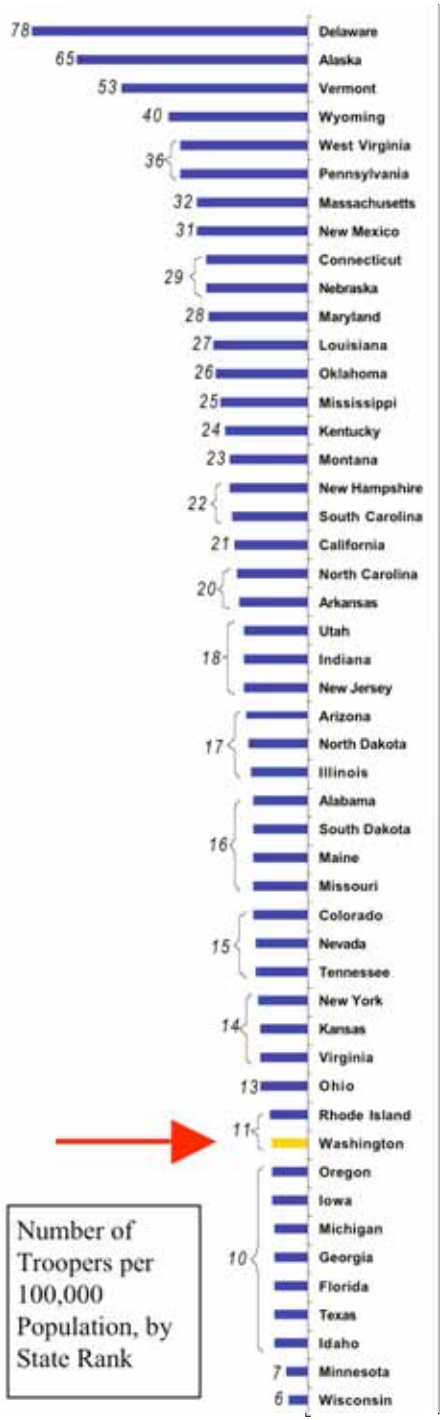
Trooper Coverage and Population



Washington Population Density Map

Washington State ranks 13th nationally in population, but ranks 40th in number of troopers per 100,000 population

Washington State ranks 33rd nationally for the number of troopers per highway lane miles (.82 troopers per 100 lane miles)

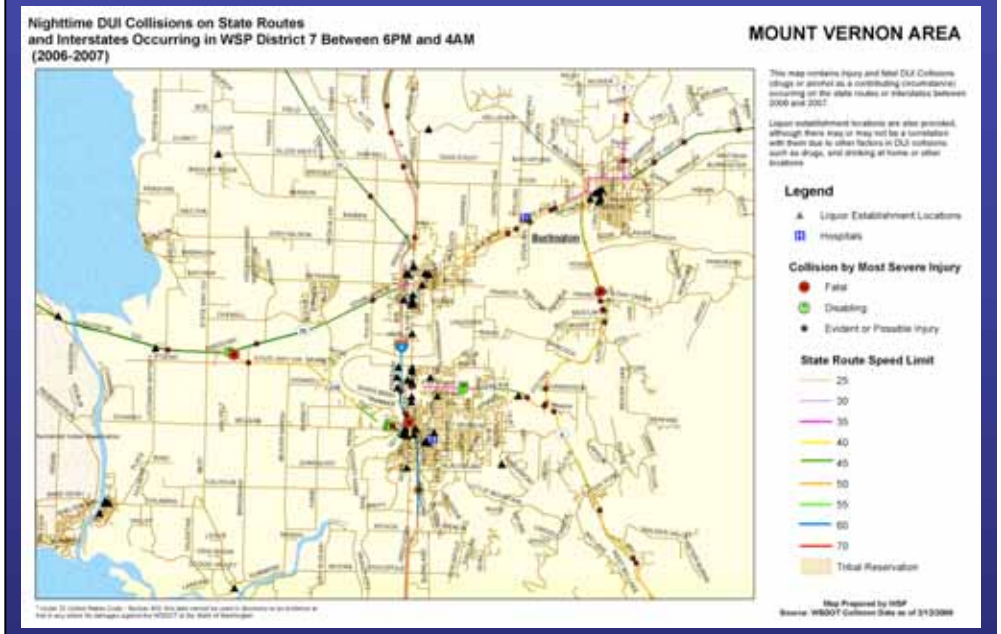


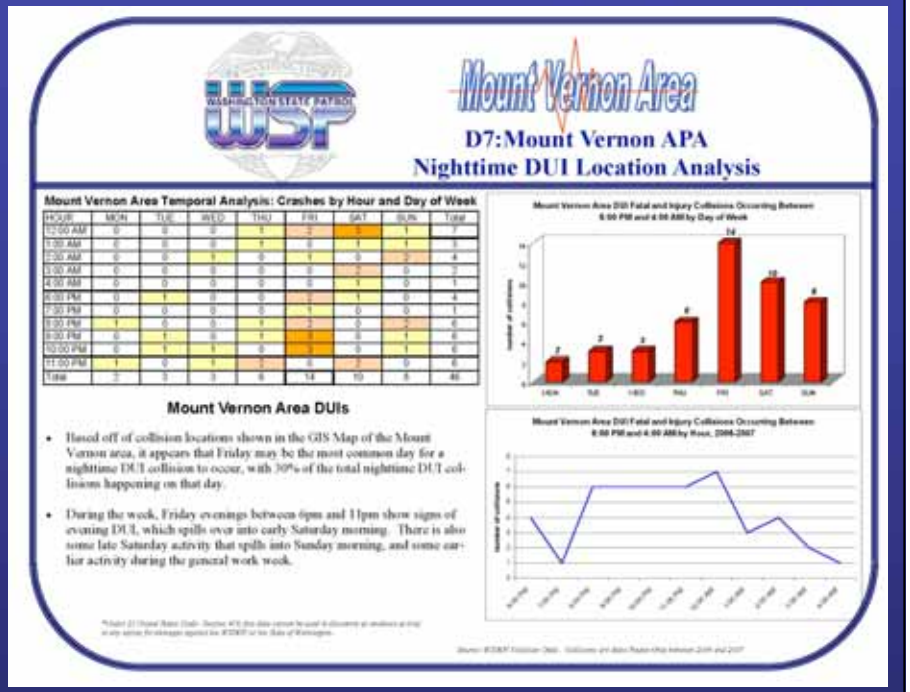
Enforcement Strategies

" The specificity of place provides insight into the influence on driving behavior of the micro-cultures of the car and the roadway on which drivers travel on a daily basis" *Moeckli & Lee (2007)*

- Problem Oriented Policing: Place-based approach
- X-52
- Corridor Program
- Focus on 2-Lane Roads

Data Strategies





Patterns and Trends Identified

Seasonal
Temporal (Day and Time)
Locationally

New Data Set Based on Location

Problem Oriented Policing

Problem Oriented Policing (POP) Defined

An organization-wide philosophy and management approach that promotes public, government, and police partnerships; and coactive problem solving to address the causes of crime, fear of crime and other public safety issues."

Policing that changes the conditions that give rise to recurring crime problems, and does not simply rely on responding to incidents as they occur or forestalling them through preventive patrols.

- Partnerships (Internal and External)
- Problem Solving (SARA model)

SARA is the acronym used to refer to the four stages of problem solving – **Scanning**, **Analysis**, **Response** and **Assessment**.

SARA Model

Scanning
- Problem identification & definition

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Analysis
- Research problem and evaluate current approach
- Narrow scope of problem
- Identify & engage your stakeholders

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Response
- Establish goal
- Brainstorm new interventions
- Develop your action plan

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Assessment
- Compile pre and post response data
- Ascertain whether goal was attained

Center for Problem-Oriented Policing

WSP Enforcement Activity

Speed Contacts: 316,232

Speed Enforcement Rate: 65%

DUI Arrests: 13,431

Seatbelt Contacts: 39,058

Seatbelt Use Rate (State Routes): 86%

Motorcycle Impounds: 190

Aggressive Driving Arrests: 54,424

Total Contacts: 731,520

Total Violators: 558,849

Total Arrests: 348,526

Total Calls for Service: 108,657

2008 YTD through October

The Statewide Corridor Safety Program Saves Lives

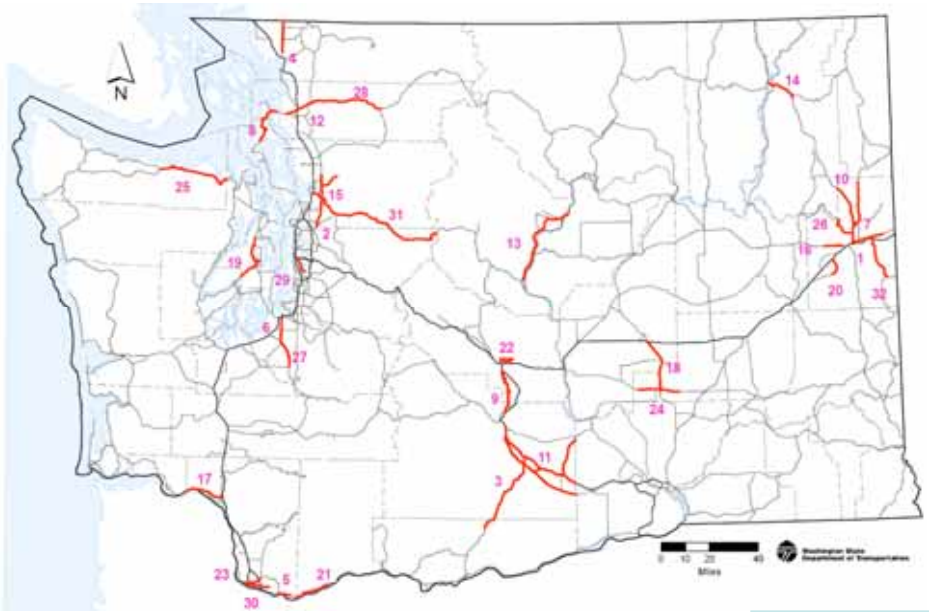
Program Goals and Partners: Improve overall safety along some of Washington State's most hazardous corridors.

- Joint effort between WSDOT and WTSC. Partner agencies include WSP, county and city governments and sheriff's offices.
- Requires local involvement. Other local involvement includes interested citizens, businesses, schools, and any other interested agencies.
- Locally coordinated, and includes local leaders chairing meetings of the steering committee.

Corridor Safety Improvement Process

- Roadway with significant crash history is identified by either the state or locals.
- Collect/prepare collision data and organize/advertise initial meeting (1-3 months).
- Initial meeting
- Action Plan development (6-12 months).
- Public kickoff.
- Implement engineering, enforcement, education, and emergency services solutions (18-24 months).
- Project completion (measure results).

Statewide Corridor Safety Program



1. East Trent
2. Snohomish County
3. US 97
4. Guide Meridian
5. SR 14
6. Mountain Highway
7. D-Zone
8. Island/Skagit Counties
9. Yakima River Canyon
10. Y-Zone
11. Lower Yakima Valley
12. Burlington/Sedro Woolley
13. 97A
14. Columbia Gateway
15. Lake Stevens
16. Airway Heights
17. SR 4
18. Moses Lake
19. Cross-Kitsap
20. Memorial Highway
21. Cape Horn
22. Kittitas/Vantage Highways
23. Fourth Plain
24. Othello
25. Driving 101
26. Francis to Nine Mile
27. Mountain Highway 2
28. Upper Skagit Valley
29. Rainier Ave. S.
30. Mill Plain
31. US 2 Drive Safe
32. Spokane Valley

Currently in progress

Above: The Corridor Safety Program began in 1991 on state routes in Washington. In 2003 the program expanded to include projects on city streets and county roads. Above is a map showing project locations around the state since the program began, from the earliest (1) to the most recent (32).

Corridor Safety Program: Strategies and Program Results

Identifying Corridors:

Selection is based on data and community support:

- Fatal and serious injury crashes per mile and per million vehicle miles traveled must rank high compared to similar roadways statewide.
- Local community support for a project must be present.

Corridor Safety Program Strategies and Partner Organizations Work Collaboratively to Improve Safety

Education: WTSC and local partners seek to inform the public of projects and not surprise them with extra enforcement. Generated awareness with target audiences by participating in and organizing events and distributing educational/promotional materials.

Engineering: WSDOT and local partners use small, low cost projects that improve safety and/or reduce congestion on state highways. Typical projects include:

- ✓Traffic control signing improvements;
- ✓Roadway striping or other road marking improvements;
- ✓Installation or improvement of traffic signals or other electronic devices;
- ✓Roadway access control through channelization or lane reconfiguration.

Enforcement: WSP and local law enforcement agencies utilize Problem Oriented Policing– an approach that promotes public, government, and police partnerships and coactive problem solving to address safety issues.

Results of the Program Show Substantial Safety Benefits

- The Corridor Safety Program has increased road safety and enhanced community relationships.
- Costs to society (based on collisions) have dropped from $16.0 Million per year to $11.8 Million per year, a savings of over $4 Million per year per project. Benefit/Cost ratio is estimated at $35/$1.
- In 28 completed corridors around the state (measuring the average of 3 years before a project versus 2 years after a project) the collision reductions are shown compared to statewide crash information for 2001 to 2006 (shown in parentheses)
  - ✓Fatal and serious injury collisions are down 34% (statewide down 10%).
  - ✓Total collisions are down 5% (statewide up 4%).
  - ✓Total injuries are down 11% (statewide down 11%).
  - ✓Alcohol-related collisions are down 15% (statewide up 8%).

Before and After Results for Corridor Safety Projects to Date (Per Year)

	Before	After
Total Collisions	199	188
Total Injuries	145	129
Alcohol-Related Collisions	20	17
Fatal/Serious Collisions	10	7

Corridor Safety Program: Case Study
SR 14/ Cape Horn Corridor Safety Project

Problem Identification

15.3 mile stretch of SR 14 in southwest Washington, designated a traffic safety corridor because of high crash rates and types.

Crash History

- 17 fatal / serious injury collisions in 3 years
- Daily volumes of 4,000 – 4,500 vehicles
- Top collision types: hit fixed object (75), overturn (20), opposite direction sideswipe (14)

Causes

- Top contributing causes: exceeding safe speed (88), over centerline (33), under influence of alcohol (11)

Enforcement Activites:

- WSP and Skamania County Sheriff's Office partnered enforcement efforts targeting the excessive speed, following too closely and improper passing.
  - ✓ Utilize lasers and in-car video cameras
  - ✓ Emphasis patrols on drinking and driving on peak evenings
  - ✓Encourage drivers to use "slow moving vehicle turnouts"

Education Activities:

- Generated community member awareness by building project support through local resident and business outreach by:
  - ✓Installing corridor information signs
  - ✓Distributing educational materials
  - ✓Launching a corridor website
  - ✓Developing media stories

Enforcement Activities:

- WSDOT initiated a number of low cost engineering fixes, including:
  - ✓Installed Corridor Safety Project signage and installed warning signs to highlight areas of concern;
  - ✓Installed centerline rumble strips throughout the corridor;
  - ✓Installed Highway Advisory Radio Systems (HARs) to warn of dangerous road conditions;
  - ✓Improved pedestrian crossings and warning information at the Beacon Rock State Park.

SR-14 Project Results: Fatal/Serious Injuries down 65%

Results:

The Cape Horn Corridor Traffic Safety Project established community relationships and inter-agency collaboration, and also made SR- 14 safer for motorists and passengers:

SR 14 Safety Improvement Highlights

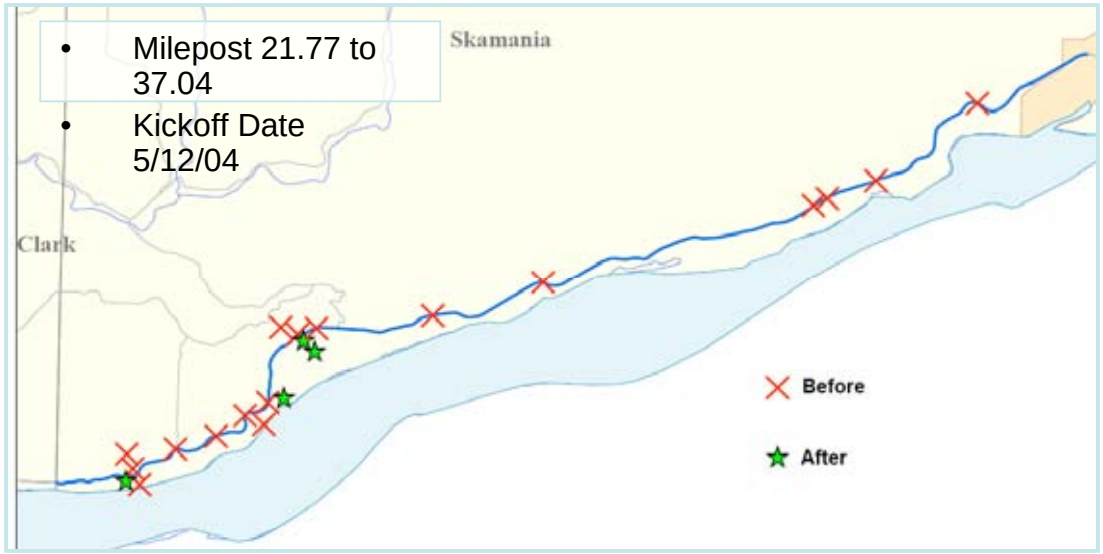
- Total Collisions **Down 16%**
- Total Injuries **Down 51%**
- Alcohol-Related Collisions **Down 57%**
- Fatal / Serious Injury Collisions **Down 65%**
- Hit Fixed Object Collisions (#1 Type) – **Down 17%**
- # Speeding Drivers in Collisions (#1 Cause) – **Down 37%**

Total Number of Collisions

Before (3 years) = 174 (58 / year)

After (2 years) = 98 (49 / year)

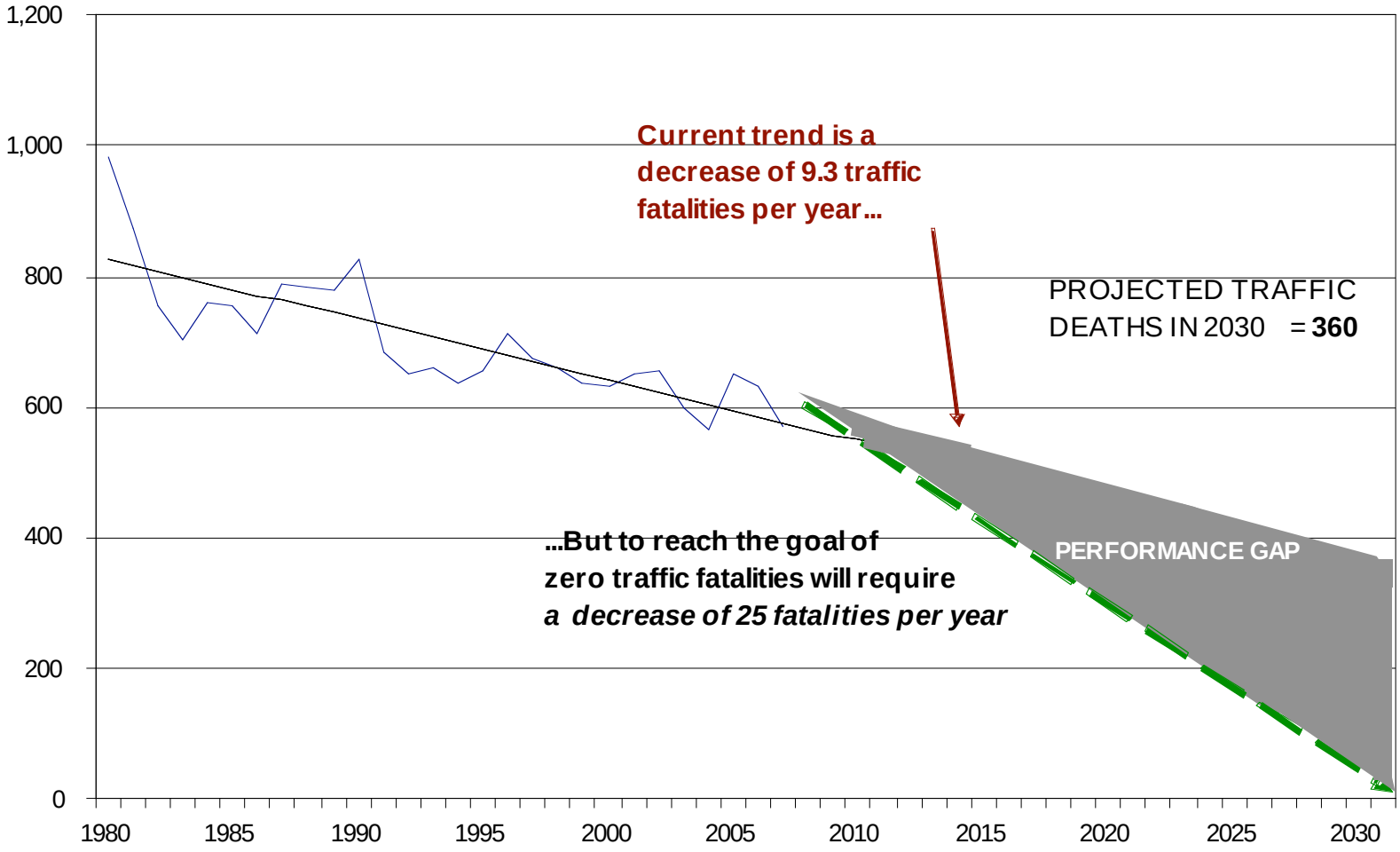
Total Number of Alcohol-Related Collisions



Washington Traffic Fatalities, 1980-2007

Projected to 2030 **(preliminary data for 2007)**

PREPARED BY WTSC - October 2008 *(Source: FARS)*



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Traffic Safety
COMMISSION

Washington State Department of Transportation